Simulation Model Mechanism Of The Universe

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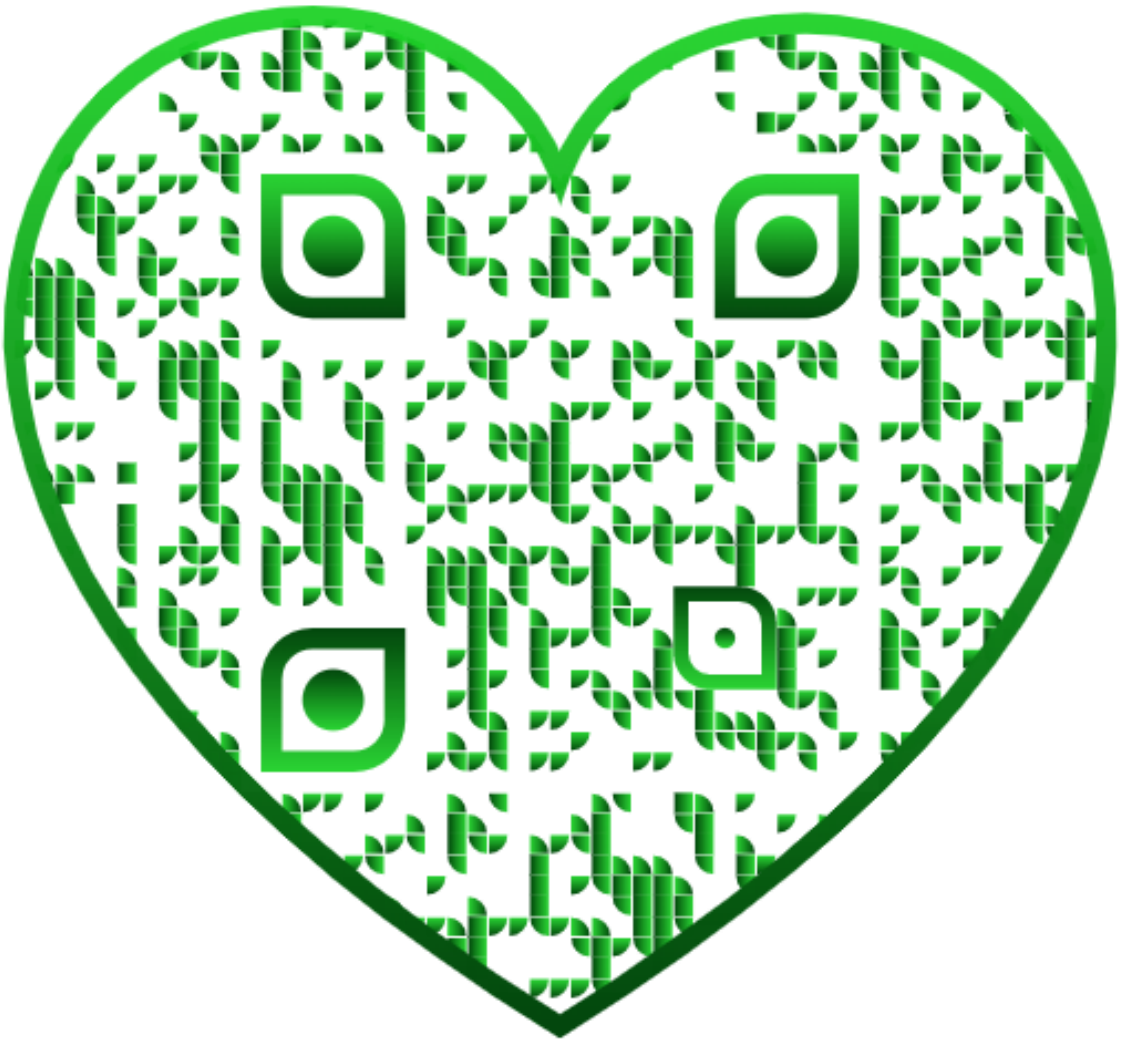

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Introduction

What kind of awareness we have about our own existence and the world surrounding us. Descartes thought the best way to achieve awareness was to start by doubting everything and building our knowledge from there. If you really want to become a genuine seeker of the truth, it is essential to doubt at least once in your life, as far as it is conceivable, all things. Is there a "real reality" higher and further then what we have knowledge of in our everyday existence.

The Bible precisely reveals the creation of the universe (Genesis 1:1). The holy book implies God thinks and acts in a way "above" our own (Isaiah 55:9). The doctrine is crystal clear the creator whom we know as God is not accountable to the laws ruling the "natural" universe (Exodus 4:21s). Humanity, as written in the scripture, has a fate far and beyond the life, we presently know (Hebrews 9:27), and there is a "spiritual realm" somehow above from the realm we usually see (1 Corinthians 2:14). It indicates we are more than physical (2 Corinthians 5:8) and there is existence "more real" than what we see or experience on earth (Hebrews 9:11; 9:24).

Our reality model is internal because it's the real way an individual subjectively perceive the external reality from the internal vantage point of his brain. This reality is internal also because it exists inside of you: your mind feels as if it's seeing the outside world, while it's literally looking only at a reality model inside your head, which in turn is continually tracking what's outside your brain via complicated but automatic processes that you're not consciously aware of (Tegmark M).

The aim to place consciousness into the physical world, usually by characterizing it as activity in the brain, has failed hopelessly. The fact is certain nerve impulses are conscious of themselves and the environment, while most of the physically identical nerve impulses are not.

Quantum physics is a science appropriately named after the idea that the basic building blocks of the universe are not infinitely divisible, actually,

they are represented by basic, discrete quanta, which is the fundamental possible “bit” of those components. Diminutive quanta partially are analogous to the pixels on the screen of a conventional computer or the binary code used in most algorithmic programs. This way of looking on simulation argument proposes the inquiry of whether our perceived reality is corresponding to the way the pixels on a TV screen associate to “simulate” certain scenery.

Deliberating over whether our existence is “simulated” or “created” is to some extent like deliberating whether a computer program is “running” or “functioning.“ Conclusively, both of these terms, simulated and created, entail that the universe we experience was intentionally arranged by an entity beyond our own realm of understanding.

As philosopher David Chalmers state, we’ll never have proof that we’re not in a simulation, because any “evidence” could merely be simulated material.

The recent endeavors to explain how the universe appeared out of emptiness, which postulates on questionable notions such as spontaneous fluctuations in a quantum vacuüm, notion of gravity as negative energy, and the inexplicable complimentary gift of the laws of nature waiting for the moment of creation, reveal conceptual confusion beneath mathematical sophistication.

There is a compelling need for a radical re-examination of the invisible structure of conduction of scientific research. We need to turn our approach away from mathematics and logically determine how we got to where we are now. Since when we discover a mathematical truth, we may simply be discovering aspects of certain simulation code an ancestor programmer wrote. Hence, it’s almost impossible to prove we’re in a real universe because any “evidence” could be part of the program.

Simulating the expanding universe requires a tremendous amount of processing power and highly advanced computing devices. Nowadays the most advanced supercomputers can simulate only a minuscule fraction of the known universe. The simulation model is on the scale of a trillionth of a meter, which is only marginally larger than an atomic nucleus. If we assume the technology advances very quickly, and if humanity successfully constructs all-powerful quantum supercomputers that have the adequate processing power, then, simulation model in the scope of molecules and macroscopic objects won’t be a challenge. After preparation of a model of

the brain in exquisite detail, scientists will be able to create artificial brains that have human reasoning.

Certainly, the nature of computation lies at the foundation of empirical science. Strangely arranged disposition of basic mathematics points to the possibility of a computer-generated reality, recent quantum research implied a universe too complex for our understanding and technological progress.

We should reflect on how a scientific appearance of the world dependent on up to 10 dimensions of space that halts on ideas, such as fundamental particles, which have neither identity nor location, connects with our everyday conscious experience of reality. This should open larger existential questions, such as the extent to which mathematical presentations capture the reality of the world and what is actually “real”.

According to Galileo, the universe speaks in the language of mathematics. The bedrock foundation of the entire universe is multi-dimensional mathematics (R. Jowsey 2015).

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Albert Einstein suspected fundamental nature might be best described by an "algebraic" theory because quantum numbers are integers (or half-integral).

Einstein said "From the quantum phenomena it appears to follow with certainty that a finite system of finite energy can be completely described by a finite set of numbers (quantum numbers). This does not seem to be in accordance with a continuum theory, and must lead to attempts to find a purely algebraic theory for the description of reality."

The RNA and DNA creationism conundrum

In 1962, scientists Watson and Crock won Nobel Prize for their discovery DNA (deoxyribonucleic acid) which is a double-helical structure. The well-ordered self-assembling structure of DNA forms spontaneously from two complementary strands.

DNA is the genetic material in humans, every cell in an individual's body has identical DNA, with a few exceptions. These differences between cell types arise when certain genes switch on or off at certain times (National Human Genome Research Institute. Epigenomics. Updated 2016. Accessed April 5, 2018)

Most DNA situate in the cell nucleus, and its name is nuclear DNA. A small quantity of DNA can also be found in the mitochondria hence it's named mitochondrial DNA. Mitochondria are structures inside the cells which convert the energy from food into a type of energy cells can use.

The data in DNA stores as a code consisted of four chemical bases: adenine, guanine, cytosine, and thymine. Human DNA consists of about 3 billion bases, and more than 99 percent of those are the same in all people on earth.

The order, or arrangement, of these bases, determines the necessary data applicable for building and sustaining an organism. DNA bases pair up between each other, A with T and C with G, to assemble units called base pairs. Each base is also connected to a sugar molecule and a phosphate molecule. All of those together, a base, sugar, and phosphate form a nucleotide. Nucleotides position in two long strands which build a spiral form called a double helix.

The structure of the double helix to some extent looks like a ladder, with the base pairs forming the ladder's rungs and the sugar and phosphate molecules forming the vertical side pieces of the ladder. An important characteristic of DNA is that it can self replicate. Each strand of DNA in the double helix is an instruction pattern for duplicating arrangement of bases. This is crucial during dividing of cells because every new cell must have an exact copy of the DNA contained in the original cell.

DNA consists of thousands of genes containing the codes for creating proteins, which in turn control cells. It lies along 23 pairs of chromosomes inherited from biological parents.

DNA requires proteins to form, and proteins need DNA to form, so how could these have formed without each other? The answer to this conundrum is RNA, which can store information like DNA, serve as an enzyme like proteins, and help conceive both DNA and proteins.

The ribonucleotide acid RNA forms complex single strand structures, in which intermolecular interactions influence directly formation of three-dimensional structures. RNA convey the instructions coded in the DNA, but it is also concluded it had developed before DNA. Scientists today believe nucleic acids of ribonucleotide acid are fundamental to the origin of life as we know it.

A question emerges if RNA pre-originates DNA, how did RNA form, so life on earth can begin. Some scientists speculate non-enzymatic, geochemical reaction created RNA since it is a highly unlikely biological process to originated RNA because then life didn’t exist on the prebiotic earth. Actually, a key question is how first biological polymers RNA could have formed without enzymes on early Earth.

The base pairs that hold together two pieces of RNA are the crucial molecular interactions in living cells. However, this is problematic, because the RNA bases don't form base pairs in water unless connected to a polymer, an aspect that has confused scientists for a long time. If the bases don't pair before they are part of polymers, how would the bases select out from the many molecules in the prebiotic medley on earth so that RNA polymers could be formed?

Heritable modification of DNA

Epigenetics is the study of heritable changes in gene expression which doesn't involve altering the underlying DNA. Influence on the complex system of control of human's genes have both the environment and genes themselves. One of the most attractive areas of research today is the study on how the outside influence such as the air we breathe, the food we eat, medications we consume, exposing to toxins, the experiences we have, affects the way our genes function.

The DNA distinguishes from the term epigenome which describes the chemical compounds and proteins that can attach to DNA. Actually, epigenetics are the chemicals and proteins which surround our DNA and influence its function. These chemicals can turn genes on and off when needed. Cells function according to these directions and this allows human organs to function properly.

Not all human genes are active at the same time or in the same place around the body. Reorganization of DNA patterns can alter which genes turn on or switch off without changing the DNA arrangement by and off itself. A chemical compound called a methyl group can be added or removed which can influence inactivate genes by making the DNA inaccessible to the system that approached to interpret it.

Epigenetic modifications are heritable, meaning they transfer from parent cell to child cell within the body. However, scientists are only beginning to understand the complex interaction of our DNA, the environment, and epigenetics.

A study done on survivors of the Dutch famine during the period of World War II revealed the effect of epigenetic changes caused by hunger during the period doesn't manifest in the survivor's children, but they do show up in their children's children.

Air pollution is a mixture of gases and particles which are either primarily emitted (e.g. from industrial processes, biogenic sources, vehicular

exhaust, combustion products, dust), or are secondarily formed in the atmosphere (World Health Organization. Air quality guidelines: Global update 2005; 2006).

Few studies determinate a significant correlation between ambient air pollution levels and germline mutation. Hypervariable repetitive DNA markers revealed higher mutation rates in human families living near radioactive contamination sites in Belarus (Dubrova Y.E., Nesterov V.N., Krouchinsky N.G., Ostapenko V.A., Neumann R., Neil, D. L. & Jeffreys, A. J. 1996 and Dubrova Y. E., Bersimbaev, R. I., Djansugurova, L. B., Tankimanova, M. K., Mamyrbaeva, Z. Z., Mustonen, R., Lindholm, C., Hulten, M. & Salomaa, S. 2002), Kazakhstan (Dubrova Y. E., Bersimbaev, R. I., Djansugurova, L. B., Tankimanova, M. K., Mamyrbaeva, Z. Z., Mustonen, R., Lindholm, C., Hulten, M. & Salomaa, S. 2002), and Ukraine (Dubrova Y. E., Grant, G., Chumak, A. A., Stezhka, V. A. & Karakasian, A. N. 2002), as well as barn, swallows nesting near Chernobyl (Ellegren H., Lindgren, G., Primmer, C. R. & Moller, A. P. 1997).

These sites, however, are unusual because the source of mutagenic pollution was either a nuclear reactor accident (Dubrova Y. E., Nesterov, V. N., Krouchinsky, N. G., Ostapenko, V. A., Neumann, R., Neil, D. L. & Jeffreys, A. J. 1996, Dubrova Y. E., Nesterov, V. N., Krouchinsky, N. G., Ostapenko, V. A., Vergnaud, G., Giraudeau, F., Buard, J. & Jeffreys, A. J. 1997, Dubrova Y. E., Bersimbaev, R. I., Djansugurova, L. B., Tankimanova, M. K., Mamyrbaeva, Z. Z., Mustonen, R., Lindholm, C., Hulten, M. & Salomaa, S. 2002) or bomb testing (Ellegren H., Lindgren, G., Primmer, C. R. & Moller, A. P. 1997), which are uncommon events in most human-populated areas.

Integrated steel production generates chemical pollution containing compounds which can induce genetic damage (Legzdins A. E. Legzdins A. E., McCarry, B. E. & Bryant, D. W. 1994 and Marvin C. H.Marvin C. H., Allan, L., McCarry, B. E. & Bryant, D. W. 1993).

Research results show human and wildlife populations near integrated steel mills are at risk of developing germline mutations more often because of inhalation of airborne chemical mutagens (Christopher M. Somers, Carole L. Yauk, Paul A. White, Craig L. J. Parfett, and James S. Quinn 2002).

There is growing concern air pollution exposure increases the risk of lung cancer. The mechanism of action relates to particle-induced oxidative stress and oxidation of DNA. Collectively, there is evidence indicating exposure to traffic-related air pollution particles associated with oxidative damage to DNA and this might be associated with increased risk of cancer (Moller P., Folkmann J.K., Brauner E. V., Danielsen P.H., Ristom L., and Loft S. 2008).

Exposure to air pollution during embryonic and early life development can result in placental epigenetic modification and fetus reprogramming, which can influence disease susceptibility in later life. Data showed prenatal exposures to air pollutants in the first trimester could influence placental adaptation by DNA methylation (Zhila M., Arash H-N.,Elham A., Effat A-P.,Mahsa S., Sara M-N., Leila Z.R., Ali-A M.H., Mehrnaz R., Fatemeh F., Atoosa A., Abolfazl O., Yasaman A., and Hadis B. 2018).

Emerging data have implicated exposure to various environmental organic pollutants as risk factors for several neurodevelopmental mortalities including ASD, attention deficit hyperactivity disorder (ADHD), learning disabilities and other cognitive deficits (Kajta and Wójtowicz, 2013; Lanphear, 2015).

Autism spectrum disorder (ASD) refers to a set of neurodevelopmental disorders characterized by impaired social interaction and communication along with repetitive, stereotypic interests and behaviors (Lyall et al., 2017a).

The genetic architecture of Autism spectrum disorder indicates an involvement of both rare and common variants, including candidate genes involved in neuronal synaptic development and chromatin remodeling (Ramaswami and Geschwind, 2018; Woodbury-Smith and Scherer, 2018).

However, genetic factors alone are not enough to account for the aetiology of ASD (Herbert et al., 2006). Research into environmental risk factors for autism has risen dramatically, providing evidence that early prenatal and perinatal environmental insults may account for a substantial part of the risk for developing ASD (Hallmayer et al., 2011; Landrigan, 2010; Rutter, 2005; Schmidt et al., 2014).

A study published in 2018 in Environment International, examined the effects of long-term exposure to air pollution on autism spectrum disorder during the early life of children in a developing country China. The study conducted on children in Shanghai, China, aged from infants to three years old, determined exposure to fine particles ($PM_{2.5)}$ from vehicle exhaust gasses, industrial emissions and other sources of outdoor pollution significantly increased the risk of developing autism spectrum disorder by up to unbelievable 78%. The study included 124 ASD children and 1240 healthy children (as a comparison) in stages over a nine-year research period, examining the correlation between air pollution and ASD.

Another population-based case-control study was published in 2015 in Environmental research. The study was conducted on children born between January 1, 2005, and December 31, 2009, in six counties in South-western Pennsylvania. Study research results indicated that both prenatal and postnatal exposures to $PM_{2.5}$ are associated with increased risk of ASD.

A study from Harvard School of Public Health (HSPH) published in Environmental Health Perspectives, concluded women exposed to high levels of fine particulate matter pollution, specifically during pregnancy, particularly during the third trimester, may face up to twice the risk of having a child with autism than mothers living in areas with low particulate matter. The greater the exposure, the greater the risk, researchers found.

Individuals diagnosed with an autism-related condition display core deficits in social communication and breadth of interests along with highly

variable abnormal phenotypes relating to affective and behavioral traits, cognitive abilities, language skills and capacities, and other etiological factors and clinical manifestations. A recently published study, for instance, makes use of nine dimensions of the phenotype for men and women with autism (Frazier T. W., Hardan A.Y.).

Research has shown some basic autism genes are part of our ape heritage, which predates the “split” that led us along a “human” path. This was when our ancient ape ancestors separated from other apes which exist today. Other autism genes are more recent in evolutionary terms, even though they are still more than 100,000 years old.

Autism, for the most part, is highly hereditary. Though a third of the cases of autism is down to the random appearance of “genetic mistakes” or spontaneously occurring mutations, high rates of autism are generally found in certain families. And for many of these families, this dash of autism can bring some advantages. All of this suggests autism is with us for a reason.

Going back thousands of years, people who displayed autistic traits would not only be accepted by their societies but could have been highly respected.

Many people with autism have extraordinary memory skills, heightened perception in realms of vision, taste, and smell and in some contexts, an enhanced understanding of natural systems such as animal behavior. Incorporation of some of these skills into a community would have played a vital role in the development of specialists. It is very likely these specialists would then have become vitally important for the survival of the group (Penny Spikins).

Michael Fitzgerald, professor of child and adolescent psychiatry in Ireland specialized in autism spectrum disorder, daringly stated in an interview in 2006:

“All human evolution was driven by slightly autistic Asperger’s and autistic people. The human race would still be sitting around in caves chattering to each other if it were not for them.”

According to the latest research findings of the relationship between ambient air pollution and raised gene mutation rates, it seems ASD is yet to play a role in human evolution.

Intelligence paradox

Intelligence is the ability of an individual to understand, plan, think, talk, rationalize and comprehend. An individual's intelligence is a complex system correlated to emotion, cognition and his general personal experience. Determination of intelligence quotient (IQ) through standardized tests represents the ratio of intelligence related to the individual's age.

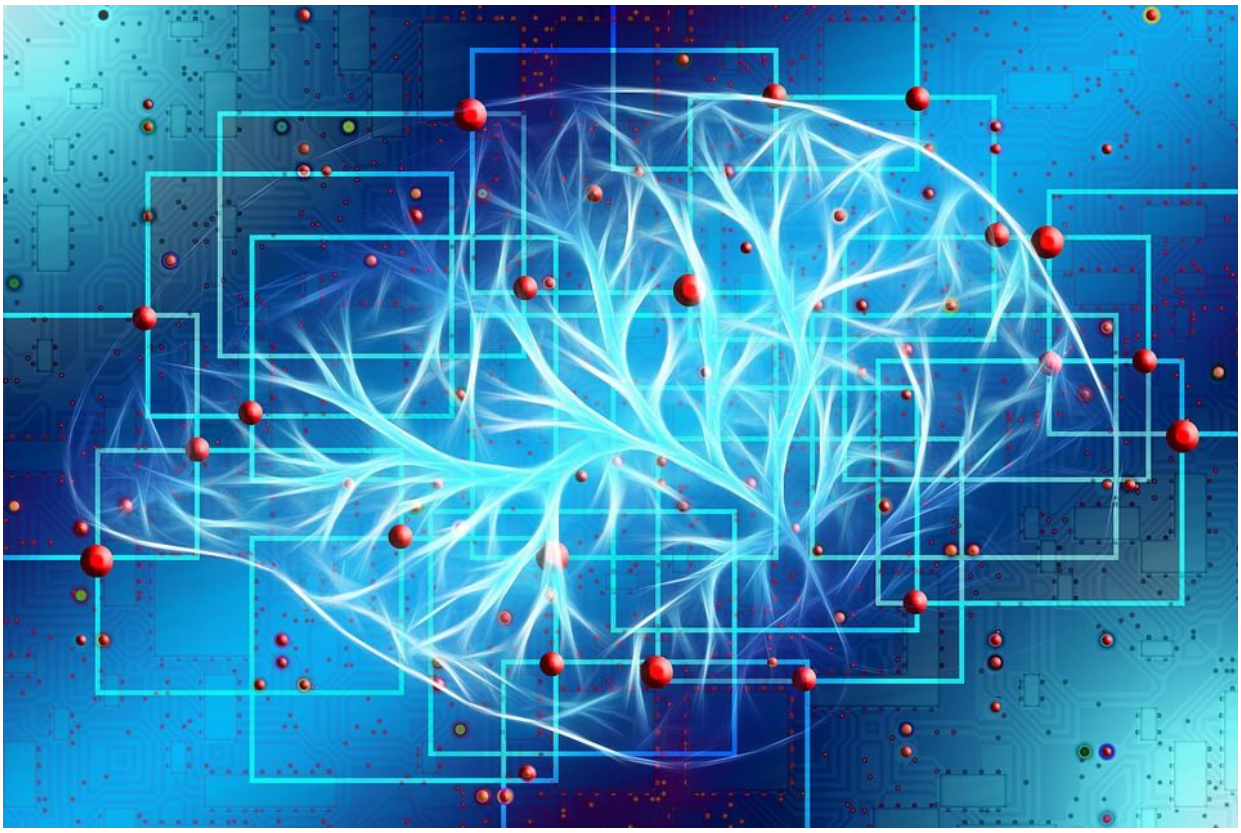
The tests are usually not a direct measure of intelligence, but they are a solution of the equation of intelligence related to age, resulting data obtained by the test's questions over given life age multiplied by hundred, is a generally closed figure of intelligence (McCall B.R. 1983).

American psychologist David Wechsler concluded an individual's intelligence is not only related to factors like capacity and quantity, rather with processing speed ability. Wechsler presented two tests: the Wechsler Intelligence Scale for Children and the Wechsler Adult Intelligence Scale. His IQ tests today are most popularly used in the world.

Few factors affect Intelligence quotient, specifically, age, sleep, and education. These factors classify as environmental and genetic. Gender has no influence over an individual's intelligence quotient.

Generally, intelligence is increasing with age, until the person is 65 years old. Despite the fact that intelligence stabilizes in early adulthood indicates genetic aspects have a more distinguished role in human intelligence during middle and old age.

Results showed that the lack of sleep has a huge impact on human intelligence since sleep helps to rest the mental and physical strengths and organize memory and thoughts. Any distribution would cause a decrease in a productivity increase of heart attack risk and most definitely lower the intelligence quotient (Imlahi 2015).



Accumulative exposure to air pollution impedes verbal test scores. As people age, the negative effect becomes more pronounced, especially for men. The gender gap is particularly large for the less educated (Zhang, Chenand Zhang 2018).

The intelligence, psychologically speaking divides into Fluid and Crystallized intelligence (Kinnie and Sternlof 1989-1995).

The first one is responsible for reasoning in unpredictable situations and finding patterns, while the second one is the ability to use skills and experience gotten from long-term memory. Crystallized intelligence improves gradually over time since one acquires more knowledge and lives new experiences (Belsky 1999).

Flynn effect is a theory that claims that human intelligence is constantly increasing over time. The average rate is three IQ points per decade. This theory was brought to light by Dr. James Robert Flynn after fifty years of research in the worldwide IQ scores.

Guessed enlightenments are that televised data, better nutrition and hygiene, smaller families and improved education could help the population

to elevate their IQs (Oommen 2014). Contributing factor to the Flynn effect is austerity of the occupation during both World wars (I and II).

A new study (Bratsberg and Rogeberg 2018) shows a declining tendency in human intelligence tests that in contrast saw people regularly obtaining higher IQ scores through the 20th century. An analysis of some 730,000 IQ test results by researchers from the Ragnar Frisch Centre for Economic Research in Norway acknowledges the Flynn effect achieved its peak for people born during the mid-1970s and has much declined ever since.

To be exact in the Norwegian study, results indicated that the average IQ score increased about three percent for men born between 1962 and 1975 – from 99.5 to 102.3. But the scores began dropping for men born after 1975. By 1989, the average IQ score had returned to 99.4.

According to the study, the researchers noticed IQ decline occurring inside authentic families, between brothers and sons, denoting that the effect probably isn't due to reposting demographic aspects, such as the dysgenic accumulation of disadvantageous genes across areas of the nation.

However, the study did not give information about specific types of environmental aspects influencing the lower IQ results. The study is most convincing evidence yet of a reversal of the Flynn effect.

Teasdale and Owen (2005) examined the results of IQ tests taken by Danish male research participants between the years 1959 and 1979, the increase in IQ total scores were on average 3 points per decade. Between the years 1979 and 1989, the increase was 2 IQ points. Between the years 1989 and 1998, the increase was about 1.3 points. In the period from 1998 until the 2004 year, IQ declined by about the same amount of points as it increased in the period from 1989 to the 1998 year.

The same authors in a comprehensive 2008 study, conducted on Danish male participants, determined that there was a 1.5 point increase between the years 1988 and 1998, but a 1.5 point decrease in the period from 1998 until 2003/2004 year.

A study conducted by Flynn (2009) in the United Kingdom, determined that IQ tests carried out in the year 1980 and comparatively in 2008 show that the IQ score of an average 14-year-old British boy declined by more than two points over the investigated period. For the upper half of the results, the performance was even worse, on average IQ scores declined by six points.

However, the expectation is that similar patterns of Intelligence quotient decline will occur, or have occurred in the population, but have not been researched, first in another developed countries and then in the developing world, as there is a limit to how much environmental aspects can enhance intelligence.

The research of scientists M. A. Woodley and R. Murphy investigated the presence of dysgenic fertility for IQ among Western nations, starting in the 19th century. Findings suggest that there is a trend related to declining IQ because high IQ people are more productive and creative.

Woodley and Murphy tested the hypothesis whether the Victorians were cleverer than modern populations, using high-quality instruments, namely measures of simple visual reaction time in a meta-analytic study. Certainly, simple reaction time measures correlate substantially with measures of general intelligence and are elementary measures of cognition.

In this study, we used the data on the secular slowing of simple reaction time described in a meta-analysis of 14 age-matched studies from Western countries conducted between 1889 and 2004 to estimate the decline in general intelligence that may have resulted from the presence of dysgenic fertility. Using psychometric meta-analysis we computed the true correlation between simple reaction time and general intelligence, yielding a decline of − 1.16 IQ points per decade or -13.35 IQ points since Victorian times (M.A. Woodley and R. Marphy 2013).

This trend of IQ declines among the human population in so long investigated period (115 years) is defeating. If the IQ decline continues as expected in the next 260 years the average intelligence among the humans in the year 2280 will be less than 69 IQ points (challenged).

If you wonder what does it mean for an individual to have a score 70 IQ points or below? In the past, an IQ score of fewer than 70 points was a benchmark for mental retardation, an intellectual disability characterized by significant cognitive impairments.

Nowadays, IQ scores alone are not enough criteria to diagnose intellectual disability. Rather, the criteria for diagnosis include an IQ of 70 points or under, proof these cognitive limitations were present before the age of 18, serious limitations in areas such as learning and reasoning, and serious limitations in adaptive areas such as communication and self-help skills.

Consciousness

In the early 1990s dr. Stuart Hameroff collaborated with mathematical physicist Sir Roger Penrose to elaborate the Orchestrated Objective Reduction Theory (Orch-OR) which is a biological theory of mind. This theory establishes that the microtubules within the neurons can increase or decrease the quantum resonance, hence modulate consciousness. Basically, it postulates that consciousness modulates within the neurons, flowing through the microtubules.

Hameroff and Penrose describe all the microtubules in neurons as quantum processors, at possibly deeper levels of the space-time continuum. This is in compliance with the educational insight that the more asymmetrical the cell is, the more microtubules it needs to keep its balance and structure.

Surprisingly, the most asymmetrical cells in the human's body are the neurons. It entails that quantum nature data processes in the intra-neuronal microtubules. Few other characteristics of this biological theory involve that consciousness is not inside the brain, that it can go back and forth in time, mechanism of free will, and that quantum events are key components of consciousness.

Actually, Penrose introduced the concept that consciousness embeds in the statistical rules of quantum physics as they relate in the microscopic spaces among the neurons in the brain.

According to neural science, the activity of the human's brain is dependent on sequences of electrical oscillations being passed from one cell to another. The way human's interact with the world and experience it is the result of these sequences of signals. Actually, brainwaves generate from synchronized electrical pulses among masses of neurons communicating with each other.

As these oscillations base on electrical conductance, we can detect them with a technique called Electroencephalography (EEG).

Understanding human brain dynamics is of importance to neuroscience. Our ability to see, model, and infer from a neuroscientific point of view, correlates to the principles and mechanisms of brain dynamics, which enables neuroscientists to understand the brain's remarkable cognitive and behavioral capabilities.

Neural scientists are doing research on how oscillations generated by nerve cells affect brain function. Although the boundaries between different wave types are fuzzy, these oscillations group by frequency. Fast gamma waves link to states of high attention (30 to 80 Hz). Beta waves involve movement and complex tasks such as memory and decision-making (12 to 30 Hz). The first neuronal oscillations discovered, alpha waves appear when a relaxed person closes his eyes (8 to 12 Hz). Theta oscillations may help the brain sort information essential for navigation (4 to 8 Hz). Slow delta waves mark deep sleep and anesthesia (1.5 to 4 Hz).

Although understanding the correct nature of human consciousness is an interesting challenge, it's not necessary for a fundamental theory of physics, which need "only" determine the consensus reality from its equations. What Douglas Adams called "the ultimate question of life, the universe and everything" splits easily into two parts that can each be tackled separately: the challenge for physics is defining the consensus reality from the external reality, and the challenge for cognitive science is to define the internal reality from the consensus reality (Tegmark M. 2015).

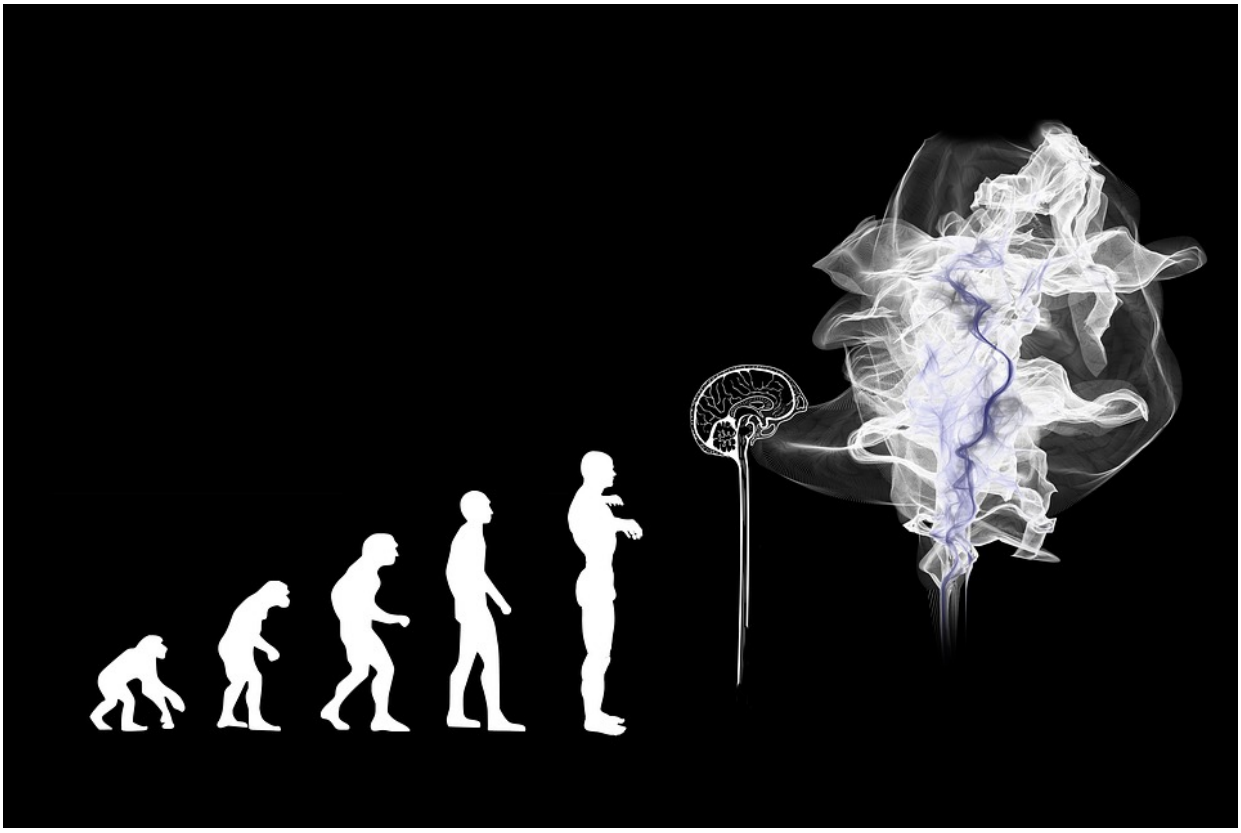
Evolutionary game theory

Game theory is a discipline of mathematics which examines the aftereffect of interactions between many people, where the outcome for anyone person relies upon not only its own actions but the actions of the other people residing in the same environment. Of course, the person does not control the decisions and actions of others.

Explicitly dynamic evolutionary game theory is the implementation of game theory to evolving community populations in biology. It defines a structure of contests, strategies, and analytics into which Darwinian competition models.

The evolutionary game theory developed as an implementation of the mathematical theory of games to the biological framework, originating from the realization that repetition dependent fitness presents an important aspect of evolution.

In the preface to Evolution and the Theory of Games, Maynard Smith notes that “paradoxically, it has turned out that game theory is more readily applied to biology than to the field of economic behavior for which it was originally designed.” The development of evolutionary game theory is an important assurance for further social science field growth.



Evolutionary biology establishes on the idea that an organism's genes predominantly determinate its noticeable characteristics. Organisms that are capable will have the propensity to bear greater descendants, causing genes with certain characteristic to raise their percentage of representation in their population.

The key insight of evolutionary game theory is that many behaviors involve the interaction of many organisms in the population, and the success of any of these organisms depends on how its behavior interacts with that of others (Easley and Klein 2010).

Complex adaptive system

A special branch of complexity science, complex adaptive systems (CAS), is a way of thinking about systems of interactive agents and how order emerges in systems from the interactions of agents (Onik, Fielt and Gable 2017).

The use of CAS is to investigate how complex systems become adaptive to their environment and how properties emerge from the interactions of the system components (Vidgen and Wang 2006).

CAS was first introduced in the science field of evolutionary biology.

A complex adaptive system (CAS) describes a collection of heterogeneous agents interacting within a particular context, adapting to each other's actions. In practical terms, this implies that behavior change is (1) socially and culturally situated; (2) highly sensitive to small baseline differences in people, groups, and intervention components; and (3) determined by multiple components interacting 'chaotically' (Gomersall T. Health Psychol Rev. 2018).

Actually, CAS is a structure of computational multilevel research, stable for modeling non-deterministic behavior, along with the option of sensitivity analysis.

Complex adaptive systems involve the interaction of many components or agents. To be able to effectively model these systems, it is extremely important to use abstraction. Abstraction is not confined to a specific discipline, and it has use in conventional life and in social communication. The science research field has examples of abstraction—double-helix/staircase model for the DNA molecule (Watson 2012), Maxwell's demon in Physics (Maxwell 1891) and rules in Medical diagnosis systems (Iantovics 2012; Iantovics et al. 2018).

Cybernetics, chaos theory and general systems theory all focus on deterministic dynamic systems, where a set of equations determinate how a system changes (i.e. experimenting with linear behavior under some

predefined conditions) in a given time-space. CAS provides another way of simplifying a complex system into a formal system (Anderson 1999).

Further, CAS can usefully represent complex systems through mathematical or computational models and such models are crucial for the analysis of the dynamic process that is too complex for understanding about language (Morel and Ramanujam 1999).

(Casti 1994; Gell-Mann 1994) Employed concepts such as adaptation, self-organization, and evolution.

The seven principal concepts of complex adaptive systems are as follows: coevolution, emergence from interactions, evolving self-organization, fitness performance landscape, the edge of chaos before the system becomes too complex, dynamic behavior and mutual adaptation.

Application of CAS has a long record in the social sciences and organizational studies (Anderson 1999, Brown and Eisenhardt 1998 and Morel and Ramanujam 1999).

Extensive research studies that investigate global environmental change processes and sustainable human development pathways such as Future Earth (Rockström 2016), and policy frameworks such as the Sustainable Development Goals (Díaz et al. 2015, Fischer et al. 2015) suggest that these challenges are best approached from a complex adaptive systems (CAS) perception (Levin et al. 2013, Reyers et al. 2018).

In reality, however, finding one's way through the theories and concepts combining CAS research is often a challenging journey (Haider et al. 2018).

Church–Turing–Deutsch principle

Turing machines, first defined by Alan Turing in the period 1936–7, are elementary fictional computational devices engaged to investigate the extent and limitations of computing. Turing's 'automatic machines', as they are known since 1937, were specially conceived for computing of real numbers. They were first named 'Turing machines' by Alonzo Church in a review of Turing's paper (Church 1937). Today, they are basic models of computability and theoretical computer science.

Turing also hypothesized there are universal Turing machines, that can compute any function computable by any other Turing machine. Universal machines execute instructions that encode performance of the machine they simulate. Turing machines are universal; they can compute any function computable by an algorithm. This result is important for computer science because it is not needed to build different computers for different functions since one universal computer will run any computable function.

Church-Turing-Deutsch (CTD) Principle, named after the three scientists (Alonzo Church, Alan Turing, and David Deutsch) who contributed the most to the formulation of this principle. The CTD Principle compose on an idea known as the Church-Turing Thesis. This principle states that every physical process is a simulation run by a universal computing device.

The origin of the CTD Principle rests in the Church-Turing thesis proposed by Church and Turing in the 1930s. The Church-Turing thesis postulate that the correct way to describe a computing machine was with the application of a Turing machine, which is almost equal to a traditional computer but is possessing an unlimited memory.

Incredibly, Church and Turing did their work before the existence of traditional computers. Their work with pencil and paper played a valuable role in the construction of the first universal computers, and Turing himself had a role in the practical construction and design of some of the earliest

machines such as Enigma during World War II and other important computing machines like ENIAC and UNIVAC.

What actually motivated Church and Turing to do such work? In fact, the motivation was a remarkable problem posed by the great German mathematician David Hilbert.

Hilbert asked whether there is an automatic procedure or an algorithm used, hypothetically, to solve every possible mathematical problem. In his inquiry, he wasn't driven by a realistic concern, because such a procedure would need a very long time to decide the truth or falsity of any given argument.

Hilbert interest was in the principle question of whether this kind of procedure is attainable. To Hilbert's amazement, it resulted that this procedure is not possible, and the people who confirmed him incorrect were Church and Turing.

So Church and Turing mathematically theorized a class of functions named, the "computable functions" that they asserted complemented the class of functions a human mathematician would intelligently be able to compute.

With this class of functions mathematically well-defined, they could advance to the second stage, which was to mathematically confirm no function in their class of computable functions could ever be used to resolve Hilbert's problem.

Church and Turing's initial stage in their research was to mathematically define the class of computable functions and put computer science on an exact mathematical foundation.

In accomplishing such a mathematical definition, Church and Turing were basically theorizing a thesis known as the Church-Turing thesis represented with the mathematical class of "computable functions" which correspond accurately to the class of functions we would naturally view as computable.

Half a century after Church and Turing's innovative papers, in the year 1985 David Deutsch prepared a paper suggesting a method to place the Church-Turing thesis on a serious basis.

Deutsch's idea established on an obvious examination that computation is inherently a physical process, in the sense any computation carried out by an actual physical computing device obey the laws of physics.

Of course, just because an examination is obvious doesn't naturally mean we acknowledge all of its indications. Deutsch realized this examination leads to an appealing option. Deutsch recommended a rewriting of the Church-Turing thesis, which is now named the Church-Turing-Deutsch Principle.

The CTD Principle says that every physical process is simulated by a universal computing device. To quote the CTD Principle given by David Deutsch: Every finitely realizable physical system is perfectly simulated by a universal model of a computing machine operating by finite means.

Thus we can easily see the Dual of CTD Principle which states that every finite realizable computing machine is perfectly simulated by a universal model of a physical system operating by finite means (A. B. Smith and S.E. Lammers 2014).

Self-replicating machines

Self-replication is a fundamental property of different compelling physical, formal and biological systems, such as crystals, waves, automata, and especially forms of natural and artificial life. Despite its significance to many phenomena, self-replication has not been persistently defined or quantified in an exact, general way, nor has it been demonstrated systematically in physical artificial systems.

John Von Neumann is well-known for his work on self-replicating cellular automata. His goal, however, was to design self-replicating physical machines, and cellular automata were simply the first step toward the goal. Before his untimely death, he had sketched some of the other steps. One step was to move away from the discrete space or cellular automata to the continuous space of classical physics (J. Von Neumann 1966, edited and completed A.W. Bruks).

Research in self-replicating cellular automata (mostly two-dimensional) is now flourishing (Langton, C.G. 1984, Reggia, J.A., Lohn, J.D., and Chou, H.H. 1998, Sayama, H. 1998, Sipper, M. 1998, Tempesti, G., Manage, D., and Stauffer, A., 1998). A two-dimensional grid consists of cells that frame a discrete space which is endless and unlimited in theory, but is inevitably limited and restricted in computational implementation.

Identical cells are finite state machines where the state of one cell is co-dependent on the states of neighboring cells, all the while following a determinative state of transition protocol. In a computational model rapid change happen easily, experiments are entirely repeatable during equal starting conditions and there is the same chance number seed.

The system begins with each cell in the first state (chosen by the user) and the states change synchronously in discrete time steps. With carefully selected transition rules, it is possible to create self-replicating patterns. The first states of the cells are “seeded” with a certain pattern (usually the pattern

is a small loop). Over time, the pattern spreads from the seed to nearby cells, eventually filling the available space (Arnold S., Peter T., Robert E., 2002).

Lionel Penrose, with the help of his son, Roger, made actual physical models of self-replicating machines using pieces of plywood (Penrose L.S., 1959). In the Penrose model, encoded data correlates to model's length, where the mechanism enabling replication of length built the physical framework of the models. Subsequently, the model needs to expand to extend the length.

Classical cellular automata

Cellular automata were developed in the late 1940s and early 1950s by scientists John von Neumann and Stanislaw Ulam. Von Neumann was determinate to solve the problem of whether a machine can possibly manufacture machines as complicated as they are. In order to clarify the problem, he contemplated that machines compose of a few small uniformed parts.

Implementing mathematical logic he determinates an automation system and a blueprint for building it can self-replicate by copying the blueprint and afterward using the blueprint's instructions for copying the automation. This process is analogous to DNA self-reproduction. S. Ulam proposed reasoning in conditions of idealized space finite states of each machine part can clasp.

Cellular automata are a class of spatially and temporally discrete mathematical systems characterized by local interaction and synchronous dynamical evolution (A. Ilachinski 2001).

Cellular automata (CA) is a standardized discrete infinite network of identical finite automation cells which state is changeable depending on individual time steps. Development of each cell is deterministic and depends upon a limited local number of so-called neighboring cells. CA theory considers each automaton as a "cell" encircled by other cells.

Each cell operates independently in the sense it functions according to its own rule or rules when determining what it will transform to in the next instant of time, but the rule of each cell is exactly the same as of every other cell, and each takes into account the state of each of its neighboring cells and transforms into its next future state on the foundations of the input data received from its neighbors present state.

The simplicity of CA architecture gives rise to a vast complexity of interaction which produces subtle patterns of a structure as the range enlarges. Observation of cellular automata architecture demonstrates it has the potential to model different interactions in the natural world, such as, a

quantum unit in our space-time interacts with its neighbors to produce diversity while complying to firm mathematical relations which take into account the quantum unit's own exact, individual state and the impinging states of its closest neighbors.

Observation of CA evolution leads to a scientific discovery: “very simple rules produce highly complex behavior” (Wolfram 2002: 39).

Cellular automata use is for parallel computation and are analogous to basic building blocks. It sometimes displays complex behavior even under the application of simple rules.

Quantum version of cellular automata has important advantage over quantum circuits because cells are not mandatory to differentiate one neighboring cell over another. In this case, cellular automata consistent rules enforce in parallel and it is not necessary for each qubit to be addressed independently.

Self-assembling machines

One of the most remarkable aspects of life is that all living organisms form through self-assembly, a fundamental biological design process by which a systematic structure apparently composes itself from a disordered assembly of smaller parts.

Self-assembly is the coordinated action of independent entities under local (distributed) control to produce a larger structure (Whitesides, G.M., Mathias J.P., Seto C.P. 1991 and Whitesides, G.M. 1995).

Over the past few decades, self-assembly has attracted a lot of research attention and transformed the relations between chemistry, materials science and biology. A typical representation of self-assembly is the growth and development of any living organism. Chemistry focuses on self-assembling molecular structures. Computational simulations are a form of self-assembly as well. Programmable self-assembly on a molecular level has been proven experimentally.

For instance research in DNA computation has led to the development of synthetic DNA double-crossover molecules which self-assemble into two-dimensional crystals (Winfree, E. 2000).

Research in nanotechnology includes self-assembling, but it is not limited to molecular structures, practically self-assembling can happen at any scale.

Self-organization of supra-molecular assemblies is the central theme of the biological systems (Whitesides et al., 1991; Lehn 2002).

As mentioned above the process of self-assembling is at the base of all biological systems. All known living cells evolve from simple building blocks which spontaneously self-associate into complex molecular machines and cellular structures (networks).

Hierarchical self-assembly is molecular nano-machine composed of tens of proteins and RNA molecules which assemble into high-ordered and well-defined structures.

Biological systems are three-dimensional, highly efficient, very complex, and are forming spontaneously through molecular recognition, into structures from simple initial building units.

Cognitive computing

Cognitive computing originates from a branch of cognitive science and it correlates the study of the human brain and its functions, with computer science.

Cognitive computing systems use computerized models made to simulate the human cognition process to find solutions in complex conditions when the results are inconclusive or uncertain. While the term cognitive computing is often used synonymously with artificial intelligence (AI), the phrase is firmly related to IBM's cognitive computer system named “Watson”.

Cognitive computing use by humans is to ease the process of making decisions. Some examples of cognitive computing applications involve aiding medical doctors in their treatment of disease. IBM Watson for Oncology at Memorial Sloan Kettering Cancer Center provides oncologists with treatment based on evidence for cancer patients. When medical professionals input questions, Watson generates a list of hypotheses and proposes treatment options for doctors to contemplate.

Cognitive systems can help scientists find previously unknown patterns. Discovery involves finding insights, connections and understanding the immense amounts of information available around the world. In the near future, cognitive solutions could help accelerate research in many important areas. Cognitive systems aid in decision-making and reduce human bias by offering evidence-based options. They continually evolve based on new information, results, and actions (L. O'Donnell and H. Fraser 2016).

Cognitive computing relates to AI and includes fundamental technologies to power cognitive applications, like expert systems, neural networks, robotics, and virtual reality. These computing systems can incorporate data from various information sources while balancing context and conflicting evidence to propose the best available answers.

The aim of cognitive computing is to simulate the thought processes of a human in a computerized model. The computer is using self-learning algorithms with applicable data mining, pattern recognition, natural language processing, and can imitate the way the human brain functions.

Using computer systems to resolve the variety of problems humans are commonly assigned with requires enormous amounts of structured and unstructured data, augmented to machine learning algorithms.

Over time, cognitive systems are capable to clarify the method with which they identify patterns and the method they process data with, so they can become able of anticipating brand-new problems and model conceivable solutions to them.

To achieve process capabilities, cognitive computing systems must have five basic characteristics, as listed below:

Adaptive: Cognitive systems are adjustable enough to learn as information changes and as aims evolve. The systems are able to abstract variable data in real-time and make adjustments as the data and environmental change occurs.

Interactive: Human interaction with the computer is an important part of cognitive systems. Users are able to interact with cognitive machines and explain their requests as those requests change. System technologies must also be able to combine with other processors, devices and cloud platforms.

Iterative and tasteful: Cognitive computing technologies can also determinate problems by inquiry or by picking in supplementary data if a stated problem is ambiguous or incomplete. The systems do this by cultivating information about analogous situations that have previously happened.

Contextual: Understanding context is fundamental in thought processes, and so cognitive systems must also in a certain way understand, identify and mine contextual data, such as syntax, time, location, domain, requirements, a specific user's profile, tasks or aims. They may function supported with multiple sources of information, including structured and unstructured data and visual, auditory or sensor data.

Imagine covering the globe with a sheet of artificial, internet-enabled neurons. And these Internet of Things (IoT) neurons could send their local information to other neurons just like the synapses in our brains. For example, a ground temperature neuron at one location gets collected and shared with air quality neurons, and vice versa.

This spatial-temporal data could allow us to make constant, finer resolution forecasts, leading us to come up with a better action plan to deal with everything from storms to droughts.

Dynamic Boltzmann Machine (DyBM) model is a bio-inspired machine learning technology that understands the spatial relevance and time-evolving nature of spatial-temporal data – all at the same time. In fact, most of the current neural network models use a microscopic approach which models the dynamics of a finite number of neurons for time-series predictions. In this approach, a network of neurons connects them one-by-one. The information does not cascade across the network as a neurotransmitter might in the brain (C. Nay 2017).

The more data the system process, the more it upgrades and learns, which makes it more reliable over time, using the neural network methodology of processing allows for a complex matrix of decisions to be implemented and the computer arrives at a solution.

The term cognitive computing is typically used to describe AI systems that aim to simulate human thought. Human cognition involves real-time analysis of the environment, context, and intent, among many other variables that inform a person's ability to solve problems. A number of AI technologies are required for a computer system to build cognitive models that mimic human thought processes, including machine learning, deep learning, neural networks, NLP and sentiment analysis (B. Marr 2016).

Where AI relies on algorithms to solve a problem or to identify patterns hidden in data, cognitive computing systems have the loftier goal of creating algorithms that mimic the human brain's reasoning process to solve an array of problems as the data and the problems change (B. Marr 2016).

As computers become augmented they are more likely to process similar to how humans think, this can expand our capabilities and knowledge in ways we are yet to understand.

Quantum computers

Quantum information science (QIS), studies information encoded in quantum systems and encompasses quantum computing, quantum communication and quantum sensing among other subfields. Quantum information is a rapidly developing field that has the potential to form the method by which information processes in the future.

Quantum computers have their principles based on quantum physics. They are the next generation of computers which overcome certain difficulties faced by classical computers. A completely functional quantum computer is one of the holy grails of particle physics.

The fundamental principle of functioning of a quantum computer is that the quantum properties are implemented in such a way where they represent and structure information, and quantum mechanisms are devised and built to perform operations with this information data.

Quantum computing is developing information technologies that aspire to harness the mechanism of quantum entanglement providing an advantage over classical mathematical algorithms and computing. Quantum computers have a range of applications including cryptography and simulation of complex physical and biochemical systems.

Quantum computers are powerful machines which represent a new approach to processing information through the postulates of quantum mechanics. Quantum computational processing has a distinctive advantage over classical (or conventional) computing because of its ability to solve problems with a large number of computations faster.

The elementary part of a quantum computer is a qubit. Qubits are found in a quantum computer as photons or nuclei of certain elements. The minute particles form the fundamental part of a qubit in the form of quantum particles actually making the qubit. They influence various physical properties a qubit exhibit. Those properties are superposition, entanglement, and parallelism. In a quantum computer, a qubit directs into two distinctive

spin directions a spin up for 0 and a spin down for 1 (M.D. Purkeypile 2009).

At normal room temperature, these photons are in a really unstable state. As they are bouncing around from a lower energy state to a higher energy state and vice versa. Though at substantially low room temperature they are at a stable spin downstate. If the spin is altered into a spin up or down position external energy is needed to do this alteration (A.C. Elitzur and L. Vaidman 1993).

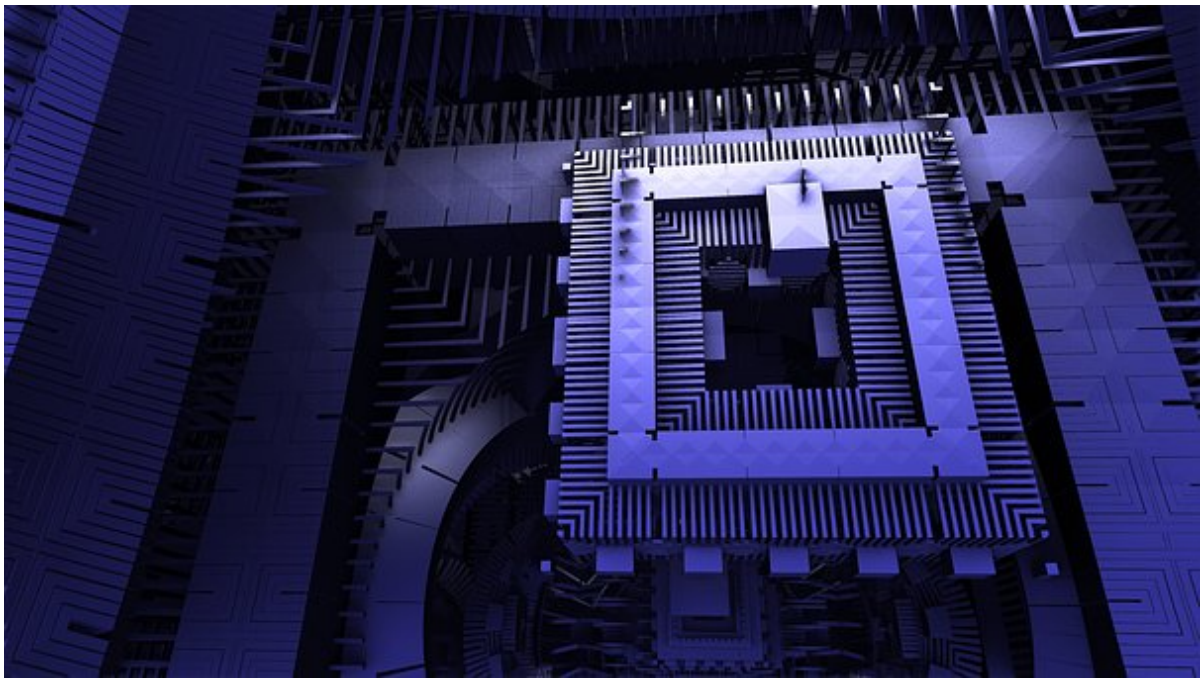
The most important ability of a quantum computer is that it can superimpose various bit with different values into a single qubit, this property is called superposition (M.D. Purkeypile 2009).

The distinctive superposition property exhibits when both the states co-exist in a single qubit. Here the qubit is depicting a |0> state as well as a |1> state individually these are basic states. Their coexistence relates by a factor called the probabilistic amplitude. This probabilistic amplitude is important to find a value for the superposition state. While measuring a photon at a superposition state only one of its constituent values is measured. A state is only measured and referred to as either a |0> or |1>. This is where probabilistic amplitude comes into play (Y.Kanamori, S.M. Yoo, W.D. Pan and F.T. Sheldon 2006).

In a quantum environment, a qubit is susceptible to any kind of change with regards to all other qubits in the system. Unlike any other computers presently in use, a quantum computer provides a working condition where all the qubits are under the influence of each other. There are no observable interactions between the particles in the quantum environment (W. Tittel, J. Brendel, H. Zbinden and N. Gisin 2000).

In a completely entangled state, a quantum computer with n qubits can entangle and superimpose 2^n classical states into n qubits (S. Nayak, S. Nayak, and J.P. Singh 2013). This is because qubits are subject to the Bell phenomenon which defines the state they confine to in a quantum system (R.A. Bertlmann, H. Narnhofer and W. Thirring 2002).

In reality, a classical operation which has 2^n inputs would need 2^n gates or have to wait for 2^n turns to produce a truth table as an output.



Whereas quantum gate with 2^n inputs would only take a single operation to produce a truth table as an output (M. Ziegler 2005).

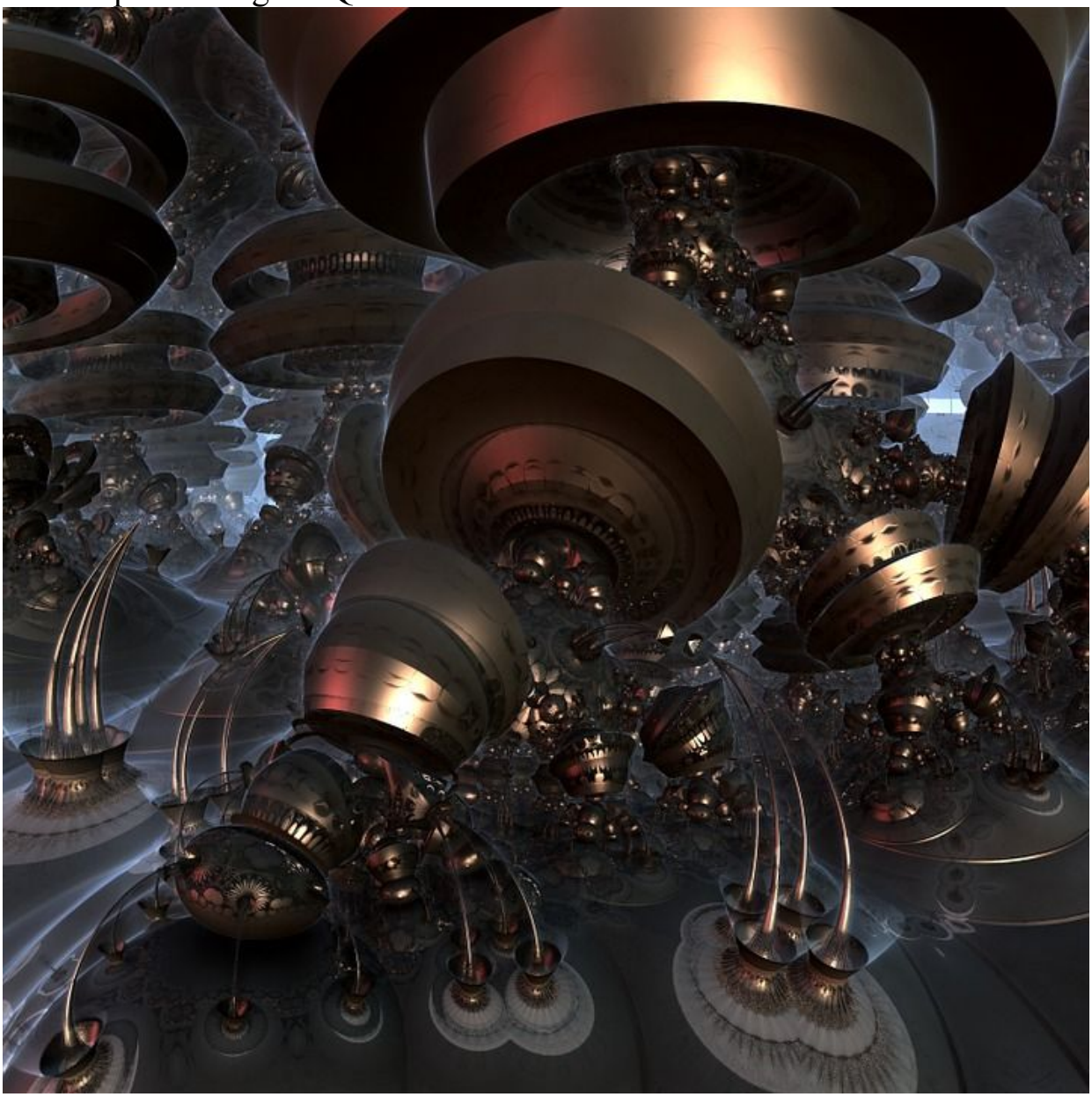
Parallelism is the property which allows a quantum computer to perform multiple operations at a time without waiting for another process to complete or there is no need for more hardware to perform the same process. However, in these gates processing input and producing an output takes a considerably longer time. This is due to the reason a lot of intermediate changes are happening due to entangled qubits in the quantum environment. This takes a longer computational time but exponentially reduce the number of computations needed for completing a single process (D. Deutsch 1985).

First of all, we should understand quantum algorithms can only solve that which a classical computer can solve. But they can solve a problem faster than a classical computer in various instances such as integer factorization, search algorithm, etc (P.S. Menon and M. Ritwik 2014).

This exponential speed-up is because of the fact quantum computers can carry out certain computation faster than a classical computer. Most of the successful quantum algorithms use Quantum Fourier transforms in them this because of the fact they need much lesser hardware. In a Quantum Fourier transform the gates needed for computing n qubits are much lesser than in a classical computer (C.M. Bowden, G. Chen, Z. Diao and

A. Klappenecker 2000). This is also the reason why Shor's algorithm for integer factorization is faster. It would only need lesser hardware as it is based on Quantum Fourier transform to carry out the repeated operation that the algorithm uses (P. Shor 1994).

Another algorithm is Grover's search algorithm, where a faster search is possible due to multiple processes running in the system at the same time in the computer using the Quantum Fourier transform.



Today a quantum computer access is through cloud technology and many thousands of people have used them to learn, do research and solve

problems.

Exponential growing series like the ones calculated in quantum mechanics is almost hard to imagine, just 230 qubits need more numbers to describe than there are atoms in the observable Universe.

Computing anticipatory systems

Robert Rosen in 1985, in his book Anticipatory systems, defined the concept of an anticipatory system, which actually is a system having a predictive model of itself and/or of its environment, which allows it to state at an instant in accord with the model's predictions about a later instant.

The verb anticipate comes from the Latin word “anticipare” meaning “to take before”. To anticipate means to realize beforehand, to foresee, to look forward to, to act in advance, to prevent, to forestall. Robert Rosen considers anticipatory systems relate to the last causation of Aristotle.

Actually, it proposes future event could produce an effect at the current moment, thus causality principle seems like it is actually reversed. In cybernetics and control theory, a goal or aim, construed at the present by an engineer, drives the impending states of the system by a feedback circumference.

A valuable class of anticipatory systems are systems with diversified eventual future potential states for which the actualization of one of these probable futures are determined by events at each current moment. Such an anticipatory system is a system without a defined future objective.

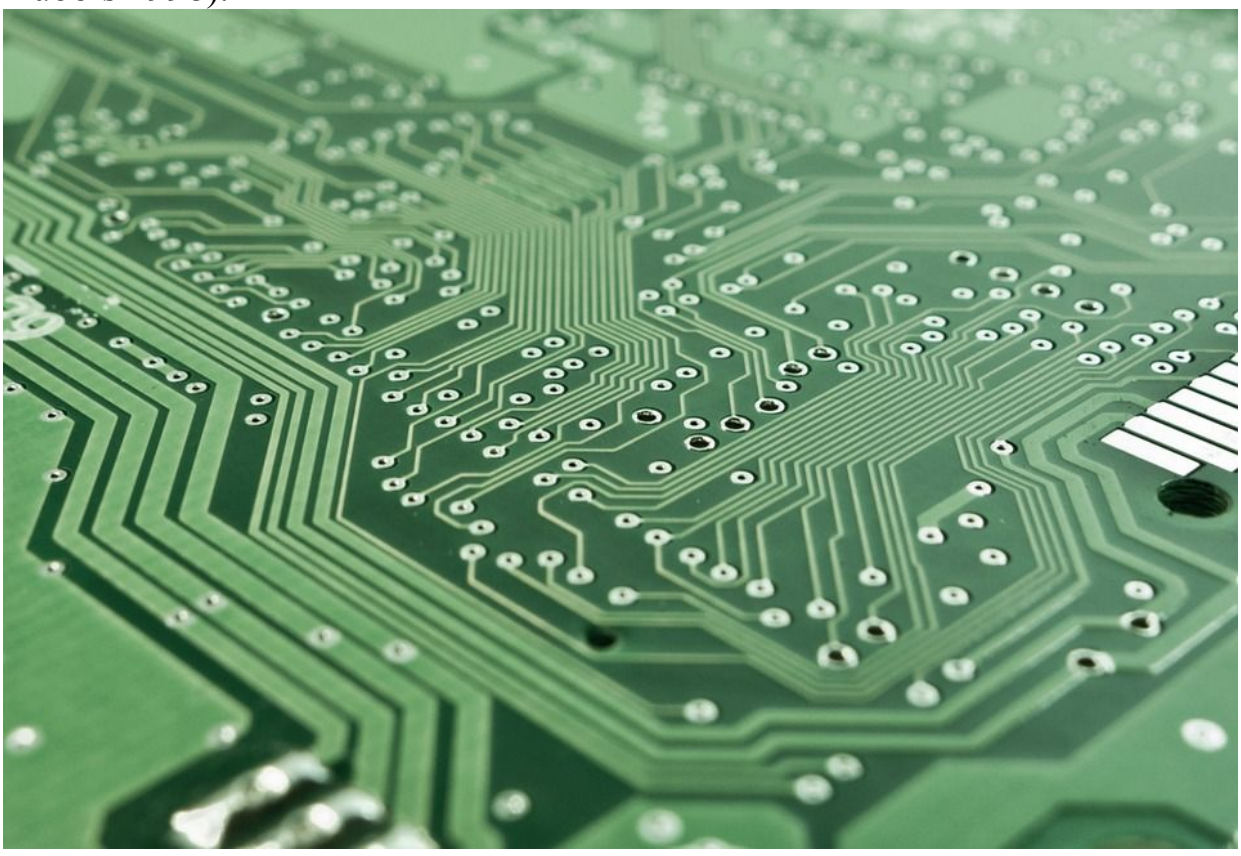
Anticipation happens when an agent makes decisions based on its categorical presumptions about events from the future. It can also refer to the ability to act in appropriate ways taking future events into account, without necessarily explicitly possessing a model of future events.

An agent engaging in the process of anticipation will try to predict the future state of the environment and make use of the predictions in the decision-making. Those systems capable of observing their own behavior can use anticipatory response-related information to generate new structure into itself. Anticipatory systems are an important class of systems containing internal predictive models of themselves and/or of their environments and whose predictions utility is for purposes of present control.

An anticipatory system could be also a system which has a set of possible responses to any potential or, changeable external events. Typical anticipatory system functioning are the co-operative dynamics of the immune system, which is a self-organizing system. All learning and evolutionary systems correspond to this class of anticipatory system.

An incursion is an inclusive or implicit recursion for which the state of a system is a function of past, present by also future potential states. Hyper-incursion is incursion with multiple solutions a priori, the future states are potentially multiple and a posteriori, there is only one realized present state.

There is a paradox easy to understand. If an anticipatory system has a model of itself, this means the model of itself must include also the model of itself and so on until infinity. There is infinity of embedded models in each other. Mathematically, there is a way to solve such a paradox. (Daniel M. Dubois 1998).



Robert Rosen in his book Anticipatory systems explains what differentiates living systems and inorganic systems is anticipation. He considers the learning processes, such as in neuronal systems, as anticipatory

systems. Rosen then proposes the same anticipation based model for learning processes and evolutionary processes.

Nevertheless, biology has situations where organisms can generate and keep up internal predictive models of themselves and their environments, and use the predictions of these models about the future for the purpose of control in the present. Many of the unique properties of organisms can really be understood only if these internal models are taken into account. Thus, the concept of a system with an internal predictive model seemed to offer a way to study anticipatory systems in a scientifically rigorous way.

Loet Leydesdorff in his paper explains simulations of anticipatory systems enable to present how an observer generates within an information process, and how expectations can also be exchanged. The exchange of observations among observers generate (a) uncertainty about the delineations in the observed system at each time and (b) uncertainty about the dynamics of the interaction over time.

Epstein and Axtell in 1996 in their foundational study of the simulation of social systems used the metaphor of ‘growing artificial societies’ on ‘sugarscapes.' Human beings have observable behavior.

In general, multi-agent models begin with the specification of the activity at the nodes. The model of relations among the agents is using a (potentially complex) function. The results of these simulations are in terms of quality of the modeling of the observable phenomena. The epistemological assumptions of this approach, however, have remained meta-biological: even if reflexivity is in the model, the exchange among

agents are considered to the end of improving performance of agents in terms of 'survival' rates (e.g., Axelrod 1997; Dittrich et al. 2003).

Second-order social systems theory focuses on the dynamics of networks in terms of the links. What do the first-order exchanges of information mean for the evolving network system? The links represent interactions and are working units of the network. These operations stand analytically orthogonal to the agents operating at the nodes. The nodes and links remain structurally coupled in the co-variation (Maturana and Varela 1980). Given the perpendicularly of the reflexive angles, one can expect the perspectives of first-order and second-order systems theory are very different (Simon 1969).

In the theory of social systems, processing of the meaning is providing social and psychical systems with the ability to distinguish between real and possible states of the system in terms of expectations. Communication of meaning is not biological, but a cultural phenomenon (Luhmann 1986).

Information by Luhmann (1984: 102f.) is a choice of the system, and not as uncertainty (Shannon, 1948).

The concept of anticipation is elaborated for a multi-agent system in terms of aggregation interaction among observations (Dubois & Sabatier 1998; Leydesdorff & Dubois 2004).

Anticipatory systems are systems containing a representation of the system itself (Rosen 1985; Dubois 2000).

Possibility of generating observers with different qualities of their separate observations elevates the question about the possibility of interaction between the observers. What happens if the observers are also able to see one another's observations?

It is possible to distinguish analytically between internal anticipation of the system and information exchanges with its environments which offer the variation. The inactive structured social systems (Lazarsfeld & Henry 1968) are expected to contain an internal sub dynamic. Giddens (1979) used the word 'virtual' for this function of the network level of what he called 'the duality of structure.' The operations over time can feedback on the structure at each moment of time.

The observable exchange relations process information historically, but the processing of meaning opens a global perspective on top of these 'instantiations' (Giddens 1984).

Atom

Many atoms make up the matter. The center of the atom is a nucleus. The nucleus contains tiny particles called protons and neutrons. Electrons orbit around the nucleus. Atoms are the key to everything (Bill N 1994).

Every single object is composed of atoms. Atom is actually the basic building block of all things, an individual atom is minuscule. In fact, the smallest atom, hydrogen, has a diameter of 10^{-8} cm. There are various types of atoms called elements. Material which is a product from the joining of various types of atoms is known as a compound. The compound consists of atoms combined in definite proportions. The smallest amount of a compound is a molecule, where the smallest amount of an element is an atom.

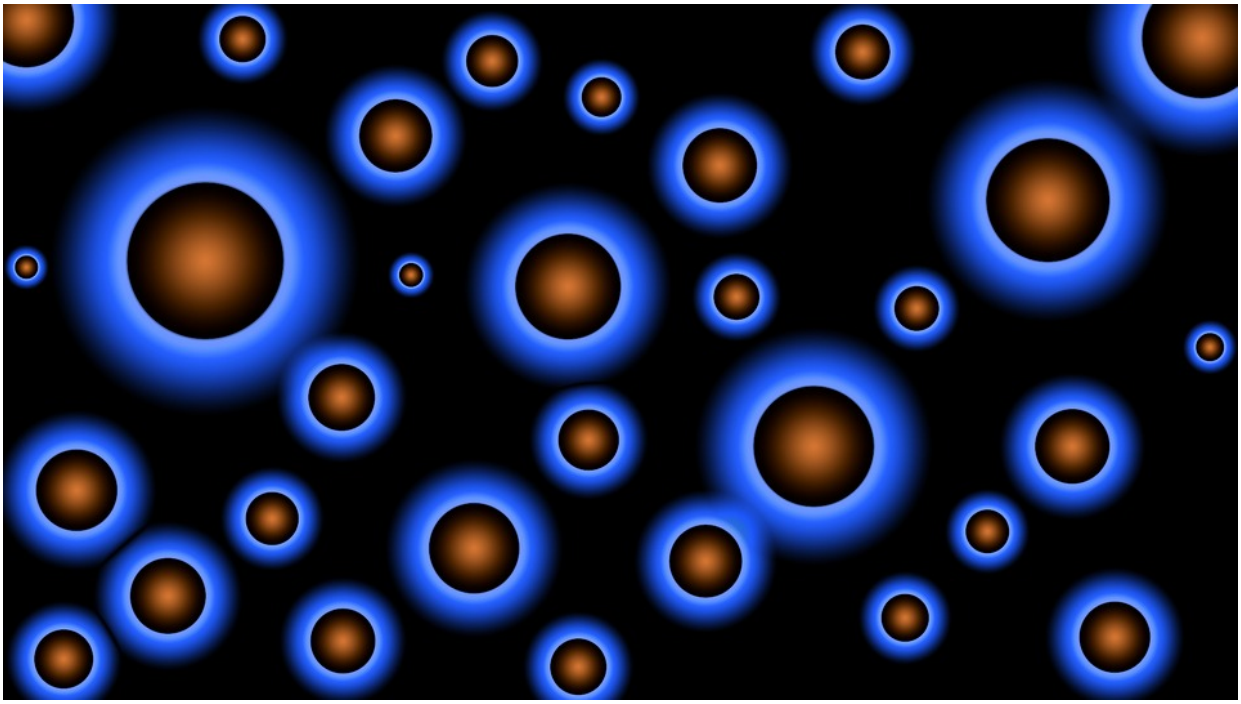
There are more than 100 elements, only a few of them are unstable and decay into other elements through a process, known in science as radioactivity. The heaviest element naturally occurring in sizeable quantity is uranium, which although is unstable, is slow to decay.

Chemical behavior is the ability of an atom to combine with other atoms via chemical reaction, depending upon the type and number of the chemical bonds an atom can form with other atoms.

The bonding capacity of an atom is determined by a number of electrons. In one atom what holds the electrons in their orbit is the electrical charge between the electrons and the protons in the nucleus.

The primary principle of action is that like charges repel and opposite charges attract. Although a proton is heavier than an electron, they both have the same quantity of electricity, but with opposite charge.

One positive proton can hold one negative electron in orbit, around the nucleus. The number of protons in a nucleus is atomic number and always equals the number of electrons in orbit around that nucleus (in a not ionized atom).



All atoms that have an equal number of protons have the same atomic number, thus they are atoms of the same element. The nuclei of an atom contain neutrons as well; they help hold the nucleus compactly together.

A neutron has no electrical charge and is marginally heavier than the proton. A neutron can decay into a proton plus an electron, this process is beta decay. Since a neutron has no charge, a neutron has no influence on the number of electrons.

The gross weight of an atom is known as atomic weight and is generally equal to the sum of the numbers of protons and neutrons, with a small extra value added by the electrons.

An isotope is an alternative type of atom which has the same amount of protons and electrons but has a different number of neutrons.

From all the scientists who had a considerable role in the creation of the Atomic theory, Dalton, Rutherford, Thompson, Bohr, and Planck are the five most prominent.

Dalton’s atomic theory consists of basic concepts related to the theory that atoms of different elements could be distinguished by differences in their weights. In this, he concluded that,

1. All atoms are composed of elements.

2. The atoms of a certain element are different from those of any other element.

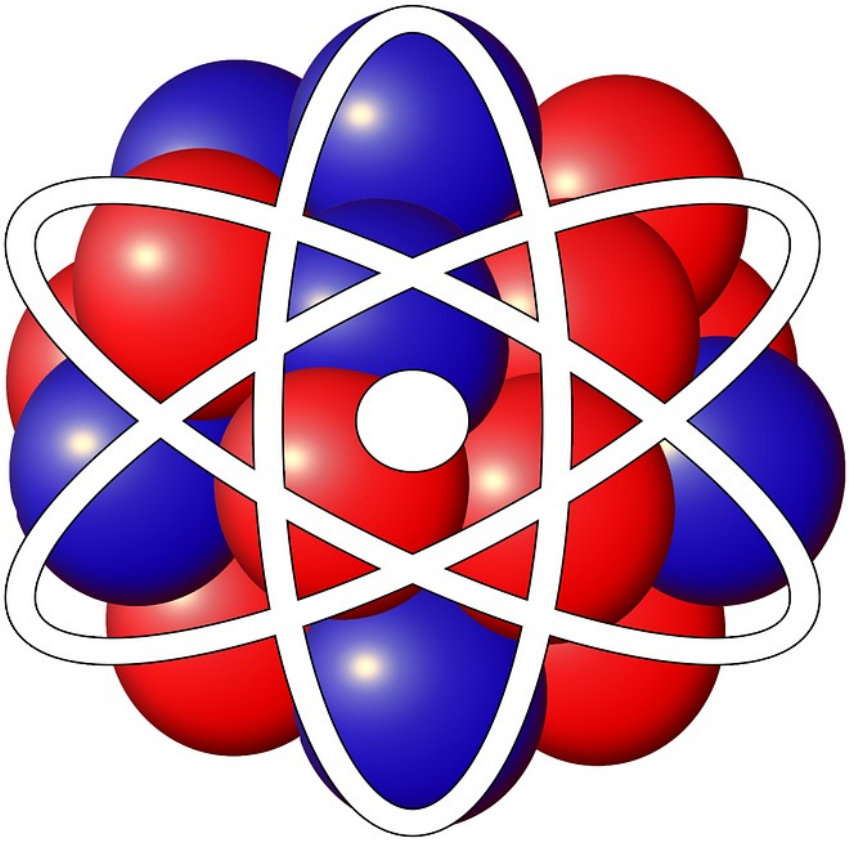
3. Atoms cannot be created, divided into smaller pieces, or destroyed in the chemical process.

4. Atoms of one element can combine with atoms of other elements to form chemical compounds.

5. When elements react, their atoms sometimes combine in more than one simple, whole-number ratio (Senese and De Leon).

The nucleus of an atom contains protons and neutrons, and the number of protons determines which element the atom is. The magnetism of the nucleus comes from a property called “spin” because it behaves much like a spinning ball of electric charge.

Only some isotopes have a nucleus with spin, and this spin makes a small magnetic field, just as the earth has a magnetic field due to the electric charge that circulates deep in its core. The magnetic field from the nuclear spin is so minuscule that it is difficult to detect, except when many millions measured at the same time. The interaction between an atom’s nucleus and its electrons, called the hyperfine interaction, makes it possible to detect the magnetism of the nucleus. For electrons, the spin results in a magnetic field about a thousand times larger than for the nucleus (J. Hunter 2018).



Two centuries ago, chemist John Dalton presented the theory that all matter in the universe consists of particles named atoms. Each atom has an amazingly small nucleus and even tinier electrons, which are ghostly objects that move around the nucleus at a distance from the center of the atom. The nucleus is around 100,000 times smaller than the atom, it consists of protons and neutrons, which themselves have a trio of fundamental particles called quarks. The mass of quarks accounts for only a tiny part of the mass of the protons and neutrons. Gluons, which clasp quarks together, are completely massless.

The atoms are mostly empty space and are basic building blocks of the expansive universe that is almost entirely 99.9999999 percent empty space. This surprising discovery that atoms are mainly empty was announced in 1909 at Manchester University by the scientist Ernest Rutherford.

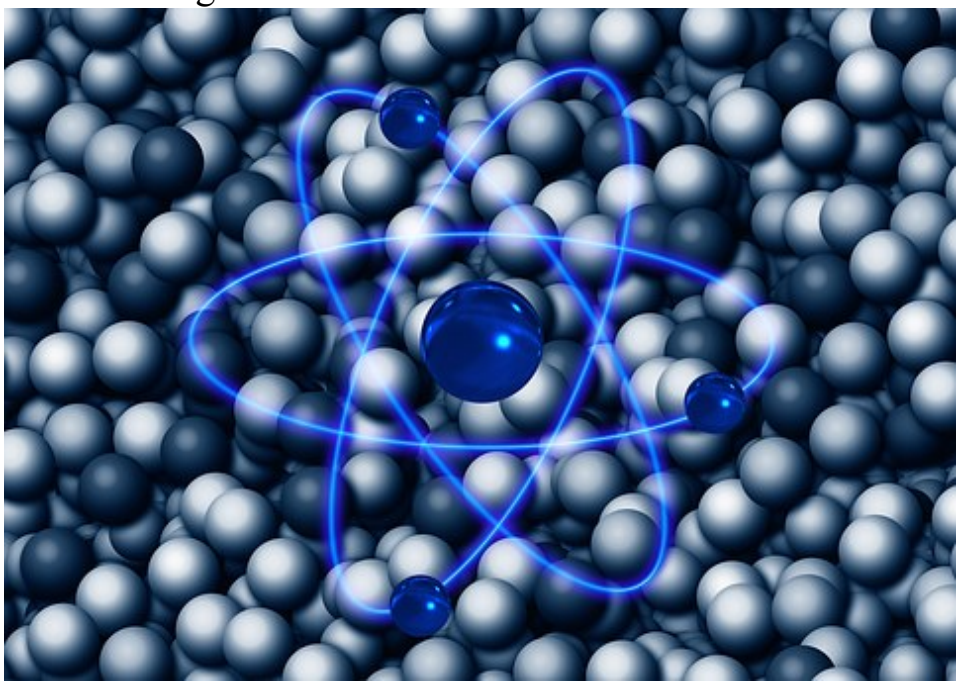
Rutherford had great courage as a scientist and was inclined to travel in the appearance of the convention. So when he announced that the atom was mostly empty, it was a tectonic moment in the history of science. Science's

response was to create altogether new science known today as quantum mechanics.

One of the most extraordinary premises of quantum theory, which has for long captivated philosophers and physicists alike, states that by the very act of watching, the observer affects the observed reality.

Researchers at the Weizmann Institute of Science have conducted a highly controlled experiment demonstrating how a beam of electrons is affected by an act of being observed. The experiment acknowledged the greater the amount of "watching," the greater the observer's contribution on what is actually happening.

When a quantum "observer" is watching quantum mechanics states particles can also behave as waves. This is true for electrons at the subatomic level. When functioning as waves, they can simultaneously pass through several openings in a barrier and then meet again at the other side of the barrier. This "meeting" is known as interference.



However, interference can only happen when no one is watching. Once an observer starts watching the particles going through the openings, the picture changes dramatically: if a particle is going through one opening, then it's clear it didn't go through another. In other words, when being observed, electrons are behaving like particles and not like waves. Thus the mere act of observation affects the experimental findings (Weizmann Institute Of Science, 1998).

The Higgs mechanism

The "Higgs mechanism," composed of the Higgs field and its interrelated Higgs boson, provides mass to elementary particles. "Mass" is the inertial mass, which opposes when we try to accelerate an object. In Einstein's acclaimed formula $E = mc^2$, the "m" is representing the inertial mass of the particle. In a sense, this mass is the essential measure, which defines, at this place there is a particle and not nothing.

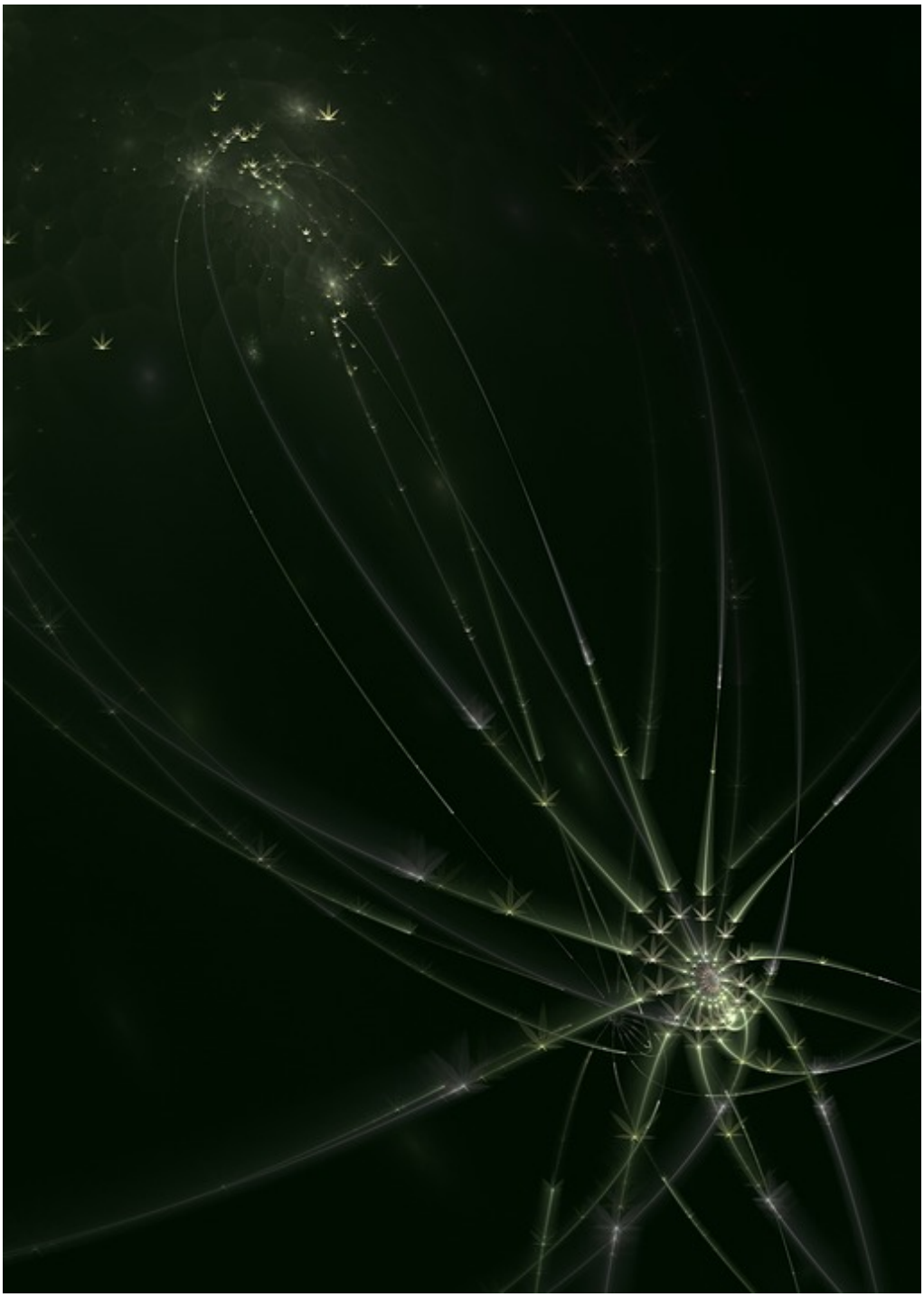
In the last few decades, particle physicists, who study the fundamental constituents of matter, have developed an appropriate theoretical model called the Standard model that gives a structure for our current understanding of the fundamental particles and forces of nature. An important part of this elegant series of equations is a hypothetical, ubiquitous quantum field responsible for giving particles their respective masses. This field is called the Higgs field. As an aftereffect of wave-particle duality, all quantum fields have a central particle correlated with them. The particle correlated with the Higgs field is the Higgs boson.

Nature inhere two different types of particles: fermions ("matter") and bosons ("radiation"). Fermions have to engage different quantum states with the aftereffect and it is not possible to have two fermions with exactly equal quantum numbers. Examples of fermions are electrons, protons, and neutrons.

Bosons, on the contrary, are not subjected to such confinement and they may occupy equal quantum states.

The photon ("light") is a boson which has zero mass and it is culpable for the electromagnetic interaction. In the Standard Model of particle physics, the fundamental particles divide into three families of fermions (6 leptons and 6 quarks) and the bosons culpable for the electromagnetic force (the photon is a carrier), the weak ($W^{\pm}/Z^0$ bosons), and the strong nuclear

interactions (gluons). Under local transformations, these physical interactions are invariant, hence the corresponding field theories are gauge-invariant and the carriers of these interactions are gauge bosons. Since these gauge bosons all have a spin of 1, they classify as vector bosons, e.g. the photon is a massless gauge vector boson. The Higgs boson on the other side has a spin of 0 and is a scalar boson. The $W^{\pm}/Z^{0}$ bosons are originally massless but they get mass through the (scalar) Higgs boson interacting with all fundamental particles through the universal Higgs field. Addition of the Higgs boson abolishes the infinities in the field equations by enabling formulation of a renormalized quantum field theory for the electroweak interaction (A. Barth, W. Marx, L. Bornmann, R. Mutz).



The Standard Model of fundamental interactions describes three types of forces: electromagnetic interactions, which cause all phenomena correlated with electric and magnetic fields and the spectrum of electromagnetic radiation; strong interactions binding atomic nuclei; the weak nuclear force

governing beta decay, which is a form of naturally occurring radioactivity; and hydrogen fusion, the source of the sun's energy.

The Standard Model of physics does not include gravity known as the fourth force. Electromagnetism is the most familiar of these known forces.

Through research, scientists have come to understand the strong and weak forces practically equally well. In the last few years, in high-energy experiments at CERN, the European laboratory for particle physics, near Geneva, Switzerland and at the Stanford Linear Accelerator Centre (SLAC), physicists have made exact tests of the Standard model.

It appears to provide an integrated description of the natural world down to ranges on the order of one-thousandth the size of a nucleus of an atom.

This “consolidation” known as Standard model of particle physics entails electricity, magnetism, light and some types of radioactivity are all phenomenon’s correlated to a particular underlying force known as the electroweak force.

The Higgs particle associates with the weak nuclear force. Electromagnetism is characterized by particles interacting with photons or the elementary units of the electromagnetic field. The contemporary theory of weak interactions describes the W and Z particles interacting with electrons, neutrinos, quarks, and other subatomic particles.

The photon apparently has no mass at all. From experiments, we know a photon can’t be heavier than a thousand-billion-billion-billionth (10^{-30}) the mass of an electron, and for theoretical calculations, we approximate it has exactly zero mass. The W and Z particles have immense masses: more than 80 times the mass of a proton, one of the elementary components of an atomic nucleus. If one hypothesizes that W and Z particles have colossal mass and interact with the other subatomic particles the Standard model becomes inconsistent.

To solve this problem it is determined there must be supplementary particles. The masses of the W and Z particles are explained only through the existence of another particle named the Higgs boson. The Higgs boson is the fundamental part of completing our contemporary understanding of the Standard Model, the theoretical edifice of particle physics.

According to CERN just after the Big bang, the Higgs field had value zero, but as the universe was expanding and cooling, the temperature fell below a certain critical value, the Higgs field grew spontaneously so any particle interacting with it acquired a mass. The more a particle interacts

with this field, the heavier it is. Particles like the photon do not interact with the field and don't have mass at all. As before explained like all fundamental fields, the Higgs field has an associated particle – the Higgs boson. The Higgs boson is the visible manifestation of the Higgs field.

Applying data poised at the CERN's Large Hadron Collider, physicists were able to measure the value of the Higgs boson mass, which is approximately 125 gigaelectron volts (GeV), or 125 billion electron volts. This exact mass is just enough to keep up the universe at the edge of instability, or at a metastable state. It is certain if this state collapses, the universe will become unbalanced, activating a catastrophic event.

Currently, the Higgs field exists comfortably at a minimum potential state and colossal energy would be necessary to transmit it to another state of existence. However, a change in energy could instigate something called quantum tunneling which would essentially provide a bypass into a lower energy state. This transition is sometimes referred to as "vacuüm decay."

If it happened, the balloon of this new vacuüm state would expand through space-time continuum at the speed of light, eliminating everything in its path.

This field can take different values at different points in space-time, and each value corresponds to the average number of particles observers see in that patch. In this view (and indeed, in reality), particles are created and destroyed at will, simply by adding or removing energy from the field.

In other words, you can punch the field and produce a few particles. One particle is just the minimum possible measure of energy the field can bear. Every single particle, from the electron to a photon, relates with its own space-time filling vibrating field.

On 4th of the July 2012 year, the ATLAS and CMS experiments at the CERN's Large Hadron Collider announced they had observed a new particle in the mass region around 125 GeV (billion electron volts).

This particle is consistent with the Higgs boson but it took extra work to determine whether it is actually the Higgs boson foreseen by the Standard Model. This was the discovery of a particle which behaves in the same way the Higgs boson should behave.

The Higgs boson is distinctive: it has zero spin, no electric charge, and no strong force interaction. The spin and parity were measured through angular correlations among the particles it decayed to. Sure enough, these

properties were determined to be as envisioned. At this end, scientists gave the particle its name “the Higgs boson.”

On 8th of October 2013 the Nobel prize in physics was awarded jointly to scientists François Englert and Peter Higgs “for the theoretical discovery of a mechanism that contributes to our understanding of the origin of mass of subatomic particles, and which recently was confirmed through the discovery of the predicted fundamental particle, by the ATLAS and CMS experiments at CERN's Large Hadron Collider”.

Multiple details about the way Higgs functions to acquire mass for other particles and why it has the properties it does remain quite perplexing indeed. The fascinating possibility that the Higgs boson is accountable for all the mass in the universe rather captures the imagination.

Actually, all matter in the universe doesn’t have mass but instead gains mass by progressing through a Higgs field, which in itself affect different particles in different ways. Everything occupying universe acquires mass from interaction with the Higgs field, responsible for this interaction is the carrier particle influencing other particles; this particle is the Higgs boson.

String theory revolution

Quantum physics and Einstein's theory of general relativity are the two pedestals which represent a considerable part of contemporary physics. Understanding how these two well-established theories relate remains a fundamental unanswered question in theoretical physics. Correlating principles of quantum physics and gravity is a dynamic area of research expected to be exceptionally active in the next period.

String theory is actually a framework which can construct models of quantum gravity. It’s one of the most dazzling, controversial and unproven ideas in all of physics. At the center of string theory is the notion, that at some fundamental level, all the different forces, particles, interactions and manifestations of reality tie together as part of the same structure.

Instead of four autonomous fundamental forces: strong, electromagnetic, weak and gravitational, there’s one consolidated theory enclosing all of them. In a sense, string theory is the best competitor for a quantum theory of gravitation, which transpires to unite the highest energy scales.

Even though there’s no experimental evidence for string theory, there are compelling theoretical reasons to conclude it might be true indeed.

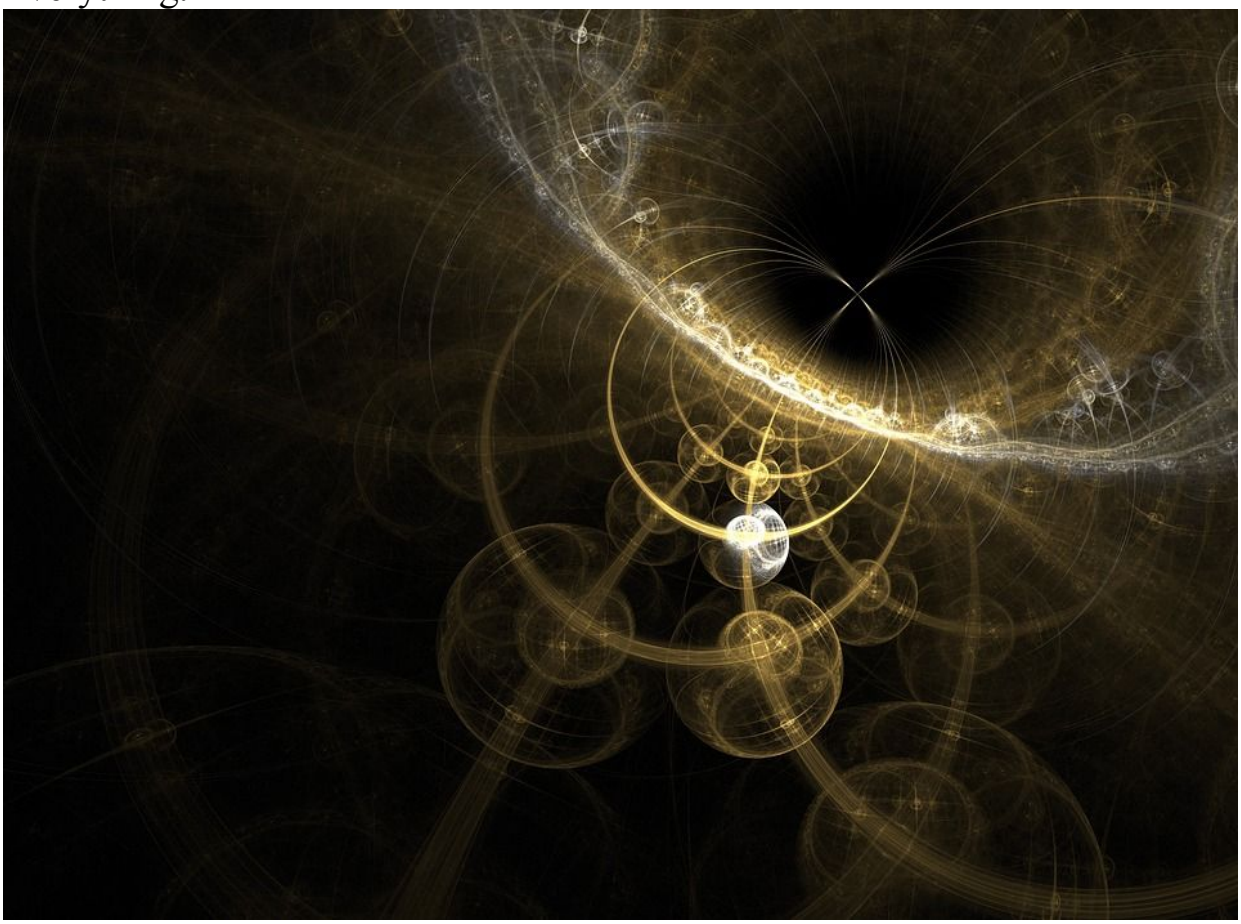
String theory offers a course to quantum gravity, which very few alternatives can definitely match. The theory is a theoretical substructure that consolidates all particles and forces in nature, including gravity, in a way compatible with quantum mechanics and relativity. Its use is to inscribe many profound inquiries in fundamental physics, including black hole physics, early universe cosmology, particle physics phenomenology, and quantum information.

In the theory, the countless of particle types are replaced by a particular fundamental building block, named a string (tube of energy). These strings are closed, like a circle, or open, like a fiber. As the string progresses through time it traces out a tube or a sheet, correlated to its property whether it is closed or open.

Additionally, the one-dimensional string is tiny (a hundred billion billion times smaller than the nucleus of an atom), free to vibrate, and various vibrational modes of the string represent the different particle types since different modes are perceived as various masses or spins.

One mode of vibration is known as a note, and it makes the string appear in reality as an electron, another as a photon. There is even a certain manner of vibration that is describing the graviton, or the particle carrying the force of gravity.

One of the most extraordinary predictions according to string theory is that space-time continuum has ten dimensions! Certainly, this is a reason to dismiss the theory, as we obviously have only three spatial dimensions and one temporal dimension. However, if we consider six of these ten dimensions are curled up very tightly, then we will not perceive them in our four-dimensional reality. Furthermore, predicting these six compact dimensions is very helpful if string theory is to construe a Theory of Everything.



For simplicity, it is usually assumed the extra dimensions are wrap up on six circles. For practical results, strings are wrapped up on mathematical elaborations known as Calabi-Yau Manifolds and Orbifolds. The idea is for this theory to allow degrees of freedom alike the electric charge of an electron which then presents simply as a motion in the extra compact directions!

The principle that compact dimensions may advance into consolidating theories is not new but dates back to the 1920s, or since the theory of Kaluza and Klein. Certainly, string theory is the ultimate Kaluza-Klein theory.

The string theory proposes that within the subatomic particles building up everything in the universe, there are circular vibrating one-dimensional strings of energy accountable for the existence of these particles, such as electrons. Thus, certain vibrations these strings of energy generate are able to produce various types of particles.

In this sense, the string theory is culpable for the presence of everything, from the composition of the atoms making up all matter to existence of spatial dimensions.

According to the Centre for Theoretical Physics of Massachusetts Institute of Technology, ideas from string theory have also led to new insights and approaches to problems in many areas of mathematics. Even though we understand string theory better, there is still no clear fundamental explanation of the theory in an independent framework, and the set of solutions is still poorly defined.

The work of scientists Washington Taylor and Barton Zwiebach connects physical insight with mathematical consistency to address these questions and has led to the development of new mathematical solutions and concepts.

Taylor's recent work has given a new systematic understanding of certain types of complex manifolds used for string compactifications and has identified specific constraints and generic properties where large classes of string theory solutions are compatible for calculation in quantum gravity theories in four and higher dimensions.

This program has led to evidence that with extra dimensions and supersymmetry, the spectrum of any consistent quantum gravity theory must arise from the solution of string theory.

Zwiebach has been at the cutting edge of developments in double-field theory. This program has identified structures of generalized geometry that

are relevant to the description of gravity in string theory, despite the advances; it is still in its beginning.

Recently, a few compelling new developments have begun to draw surprising correlations between a number of problems about aspects of gravity, black holes, quantum information, and condensed matter systems. It is clear quantum entanglement, presented through holographic duality, determinate a postulate of space-time geometry. These developments relate to the research activity of several faculty members of Centre for Theoretical Physics of Massachusetts Institute of Technology, including Aram Harrow and Hong Liu.

According, the top string theorist, Ed Witten, working in three spatial dimensions is very challenging, and when a physics problem is demanding, we often resolve to an uncomplicated version first. If we represent the problem in one dimension, things become very simple. The only conceivable one-dimensional surfaces are open strings, where there are two separate, unattached ends, or a closed string, where the two ends connect to form a loop.

Additionally, the spatial curvature is very complex in three dimensions. If we want to add in the matter, the result is, a set of scalar fields representing certain types of particles and the cosmological constant. The extra degrees of freedom a particle gains from residing in multiple dimensions doesn't have much of a role; as long as there us momentum vector, which is the basic dimension property of any importance in this case.

In one dimension, therefore, quantum gravity is a free quantum particle in an arbitrary number of dimensions. Quantum gravity presented in one dimension is a single particle interacting in any number of dimensions.

But if we make the transfer from point-like particles to string-like entities (tubes of energy), operator-space correspondence is necessary supportive calculation method. This input conditions adjustment was missing because before there wasn't any correspondence between operators, the functions representing quantum mechanical forces, properties, and states were not present, and it was unknown how the particles and their properties evolve over time.

The real revelation about string theory is that it is quite capable to produce a functioning quantum theory of gravity. Right now, there are only a few sets of dimensions the string/superstring framework is self-consistent in, and the most promising one doesn't define the four-dimensional gravity of

Einstein which construes our universe. Instead, we have a 10-dimensional Brans-Dicke theory of gravity. In order to describe the gravity of our universe, one must put aside the six dimensions and take the Brans-Dicke coupling parameter, ω, to infinity.

The term compactifications in the context of string theory is actually inclination word to recognize we must find a solution to these problems. But how we determine Einstein's gravity in 3+1 dimensions from the 10-dimensional Brans-Dicke theory remains an open challenge for string theory.

The main problem is for now string theory exists firmly only in the scenery of theoretical physics, and is not yet experimentally proven. String theory may simply be the best mathematical language for an encounter with certain aspects of reality, as we comprehend it, or maybe not?

Mother of all theories (M-theory)

M-theory is an adaptation of superstring theory developed by Ed Witten of Princeton and Paul Townsend of Cambridge.

To quote Einstein “Nature shows us only the tail of the lion. But I do not doubt that the lion belongs to it even though he cannot at once reveal himself because of his enormous size.” Einstein devoted 30 years of research to find the “tail” that would bring him to the bigger reward the “lion” himself known as “Theory of everything”. The thinking has quite a simple nature, to unite the four fundamental forces: gravity, electromagnetism, and the strong and weak nuclear forces, in one equation.

Actually, in comparison to the other forces, gravity is extremely faint. The reason for this deficiency could be that gravity interacts with more than the three spatial dimensions and one temporal dimension.

The particles recognized in nature are classified according to their spin into bosons (integer spin) or fermions (odd half-integer spin). The bosons are the ones transferring forces, for example, the photon, which transfers electromagnetic force, the gluon, which transfers the strong nuclear force, and the graviton, which transfers gravitational force.

The fermions make up the matter we are made of, like the electron or the quark. The original string theory only described boson particles, hence the name bosonic string theory. It did not describe fermions. So quarks and electrons, for instance, were not included in bosonic string theory.

By introducing supersymmetry to bosonic string theory, we can distinguish a new theory determining both the forces and the matter which fills the Universe. This is the theory termed superstrings. There are three different superstring theories which have merit and doesn’t display any mathematical inconsistencies.

In two of the theories the central object is a closed string, while in the third, open strings are the basic building blocks. Additionally, combining the best characteristics of the bosonic string and the superstring theory, we can

hypothesize two different, but consistent theories of strings, heterotic string Theories.

Certainly, this plethora of theories of strings was confusing: If we are searching for the theory of everything, to have five theories is a humiliation! Fortunately, M-theory appears to explain the missing links.

One of the basic foundations of the M-theory corresponds to the aspect that the theory resides not in 10 but in 11 dimensions of multidimensional hyperspace.

This characterization is presenting us with the view of M-theory as an 11-dimensional theory appearing 10 dimensional at some points in its framework of parameters. This theory has as a central object a membrane, as opposed to a string. The membranes look like strings when we curl the 11th dimension into a small circle.

Holographic duality

Duality is a relation between two things where the properties of one interpret the properties of the other. Probably the most impressive duality in physics is the holographic principle. This principle states there is a duality between a volume of space and the surface encasing that volume. According to the holographic principle, all the information contained within the region of space is defined by information on the surface enclosing it. Mathematically, this means the volume of space is represented as a hologram of the surface.

In the year 1993 the distinguished Dutch theoretical physicist Hooft presented a daring postulate, which is consisted of two basic assertions:

Assertion 1: The first assertion of the Holographic Principle is that all the information contained in some region of space is represented as a `Hologram', a theory which `lives' on the boundary of that region.

Assertion 2: The second assertion of the Holographic Principle is that the theory on the boundary of the region of space in question should contain at most one degree of freedom per Planck area.

A Planck area is the area contained in a little square which has side length equal to the Planck length, a basic unit of length. The Planck length is a measure of length dimension which constructs out of the basic constants G (Newton's constant for the strength of gravitational interactions), (Planck's constant from quantum mechanics), and c (the speed of light).

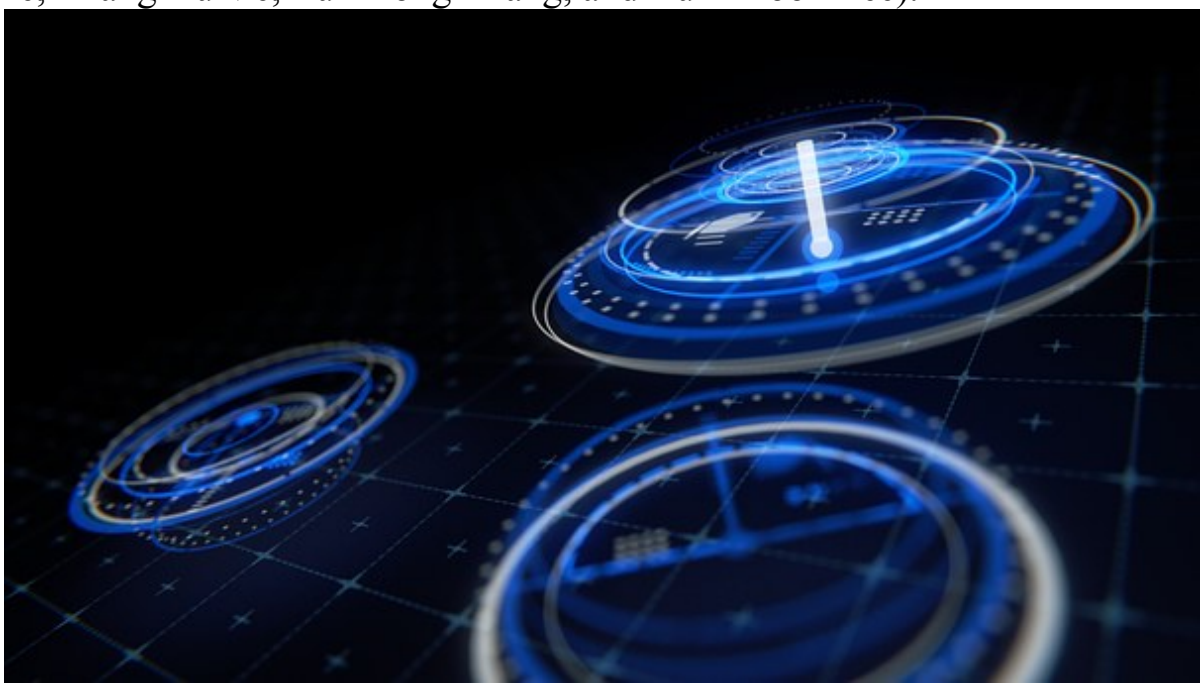
Unrelated to the direct application to problems of quantum gravity, string theory has recently generated a rapidly developing new area of research where "holographic" dualities relate theories of gravity in one space-time to strongly coupled quantum theories in space-time of one less dimension.

Originally presented in the concept of string theory, these dualities seem to supply correct mathematical equivalence among the two correlated theories.

These dualities contribute both to a new perspective into quantum gravitational phenomena as encoded in quantum field theory, and a way to analyze aspects of strongly coupled field theories using the gravitational duality.

Holographic duality termed the AdS/CFT correspondence, was originally proposed by Maldacena in the year 1998. The duality consistently works in the framework of 10-dimensional hyperspace which is actually critical string theory. The mathematical contraption known as holographic duality is successful where traditional mathematics deteriorate.

The holographic duality represents a major advancement in our perception of string theory and quantum gravity also provides a powerful toolkit for studying strongly coupled quantum field theories. Thanks to this duality, challenging questions about dynamics in quantum phases of matter in strong coupling regime are mapped to processes in theories of gravity which are tractable. This was helpful in describing unconventional physics in many fields, such as gauge theory, condensed matter, information theory, and systems studied in hydrodynamics (Li Li, Hai-Qing Zhang, Song He, Zhang-YuNie, Yun-Long Zhang, and Bum-Hoon Lee).



For example, imagine the 3 D interior and corresponding 2 D surface of a hypothetical body of water. For the correspondence to work properly, the interior is mathematically characterized by string theory, where electrons, photons, gravitons, and other particles are tiny one-dimensional strings.

Mass and other properties relate to the vibrations of the strings, and interactions between various types of matter and forces arise from the way strings split and connect. These strings, of course, reside inside the hypothetical body of water.

Now, consider that the 2 D surface of the hypothetical body of water is presented through quantum mechanics. Particles are the spattering on the surface of the water, and the waves are the after effect presented by the ripples from this spattering. Hypothetically on the surface of this imaginary body of water, there is no interacting force of gravity.

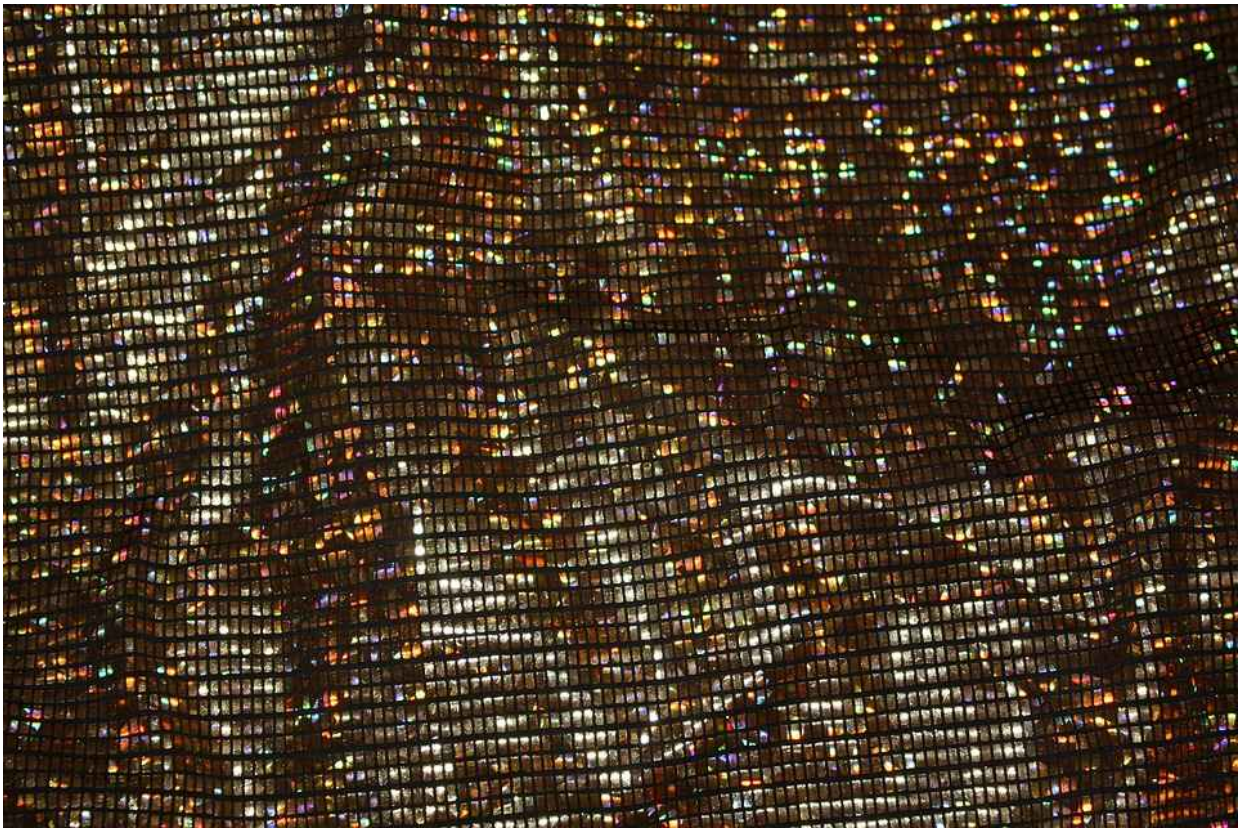
Holographic duality, determinate events in the interior region, involving gravity, mathematically analogous to occurrences on the surface, which are for this hypothetical case, gravity-free and dictated by quantum particle theories.

According to physicist J.D. Bekenstein concrete examples of functioning holographic principle involves so-called antide Sitter space-times. The ingenious de Sitter space-time is a model universe first determined by Dutch astronomer Willem de Sitter in 1917 as a solution of Einstein's equations, containing the repulsive force known as the cosmological constant. De Sitter space-time is containing nothing, expands at an accelerating rate and is immensely symmetrical.

In 1997 astronomers studying distant supernova explosions came to the conclusion that the universe is now expanding in an accelerated trend and will probably become increasingly like a de Sitter space-time in the future.

Now, if the repulsive cosmological constant is replaced by an attractive one, de Sitter's solution turns into antide Sitter space-time, which has equal symmetry. More important for the holographic concept, it maintains a boundary, which is situated at infinity and is alike our everyday space-time.

Using antide Sitter space-time, theorists have devised a concrete example of the holographic principle at work: a universe described by superstring theory functioning in an antide Sitter space-time is completely equal to a quantum field theory operating on the boundary of that space-time. Thus, the full greatness of superstring theory in an antide Sitter universe is painted on the boundary of the universe (J. D. Bekenstein 2007).



This conclusion is these two evidently very different theories, which are not even acting in spaces of the same dimension, actually, are equal. Creatures living in one of these universes would be incapable of determining if they inhabited a 5-D universe described by String theory or a 4-D described by a quantum field theory of point particles (J. D. Bekenstein).

Contemporary string theory uses vastly the concept of holography because it states any theory of gravity can be described by theory without gravity in one less dimension. Holography correlates the quantum theory of gravity to particle physics theory with no gravity involved. Holography is valuable toolkit in addressing open questions in black hole physics, and in composing new mathematical models for cosmology, condensed matter physics, and strongly interacting particle phenomenology.

Finite Nature

Theoretical physicist and digital philosopher Edward Fredkin's hypothesis of Finite Nature commences with the presumption that all things ultimately are discrete and, and nothing is possible to exist in smooth or continuous form. This is an assumption that all things are finite and limited to their conformed, quantized, discrete units of being.

If we hypothesize all matter in the universe is discrete, then it is characterized by a finite set of information. This set of information is accompanied by a process inducing it to evolve from one "frame" of time to the next. The standard model for the meaningful transformation of one finite set of information to another is the computer and in particular, the computer design known as "Cellular Automata."

A property which is discrete can be represented accurately. If space-time continuum and all physical processes are fundamentally discrete, then for a particular unit of volume of space-time there will be a limited, finite number of combinations that will characterize all the possible states of everything comprised within that volume. Certainly, this means for every volume of space-time there will be a definite and finite quantity of information incorporated within it.

When Fredkin explores the concept of "information," he is talking about a "scalar quantity," that is, actually, something which is "capable of being represented by a point on a scale," or "a quantity that has a magnitude describable by a real number and no direction."

The idea of proposing information is fundamental, is still very far from adequately explaining the laws of nature but remains an intriguing hypothesis worthy of continued research.

Fredkin assumes research will find there is no infinite and no infinite small, which means all matter is finite.

He goes to explain that from one instant moment to the next, or from one time-step to the next, the information is transformed effectively to a new and

different, but uniformly finite, set of information describing the particular volume of space-time as it exists in the next moment of time.

By compressing the volume of space-time to an allegorical representation of the information it contains, Fredkin crops the full equivalent of the volume of space-time in the pattern of the information itself.

As explained in Finite Nature, a computer starts its process with one set of input information and proceeds to the next, distinctly different set of information. The computer's process is dictated by steps, running through a series of ritualistic modifications of the information according to a rigorous set of programming rules. It is the operation of the programming rules that affect transformation from the present state of the information to the next succeeding future state.

As the memory bits are being interchanged, the internal arrangement of the computer is in a state of transition. A computer accomplishes this orderly progression through a hardware technique named single clock.

As Fredkin explains, "Single clock means that when the computer is in a state, a single clock pulse initiates the transition to the next state. After the clock pulse happens, various changes propagate through the computer until things settle down again. Just after each clock pulse, the machine lives for a short time in the messy real world of electrical transients and noise. At the

points in time just before each clock pulse, the computer corresponds exactly to the workings of a theoretical automaton or Finite State Machine."

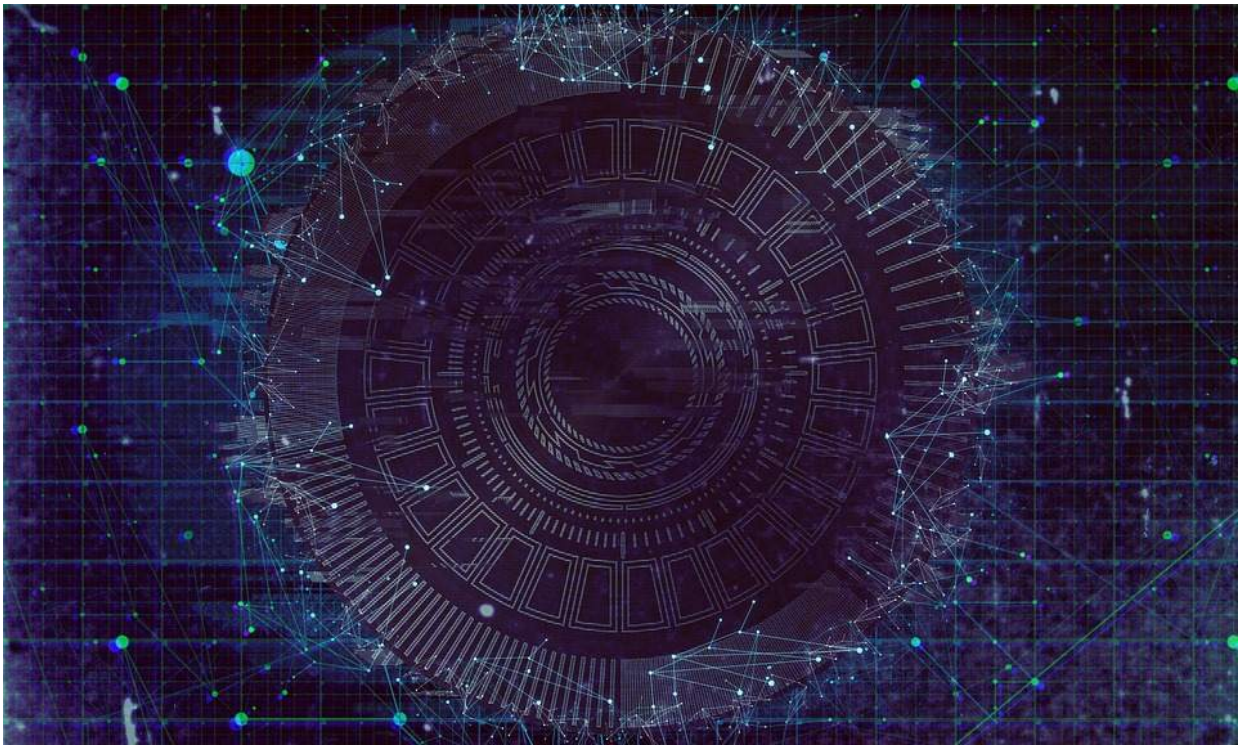
The computer's process of transition is not emulated by the state of the computer's memory itself but remains in the abstract application of the rule or rules. We do not "see" the transition, not even the process of transition, as it transpires as s case of quantum mechanical transitions, or "quantum leaps".

Fredkin wrote that certain type of computer architecture presents a definitive correlation for the concept of discrete blocks of space-time which evolve, both individually and collectively, from moment to moment.

This architecture designates each computing unit as a "cell," which functions as though it were a self-sufficient computer with an elementary set of programming algorithms. Because it is operating self-sufficiently and automatically, following its instructions, the cell is named "automaton". Collection of multiple computing cells is the "Cellular Automata" computer architecture.

There is no discrepancy in principle between the single cellular automaton and any other conventional computer. Both are composed of a block of memory which is acted upon by a set of programming algorithms. The distinction is that the cellular automaton operates according to a critically restricted set of rules (programming), and so it requires a modest quantity of memory. Under these conditions, we can produce an extensive number of cellular automata utilizing our finite memory and programming resources. The key to the utility of the cellular automata computer architecture is when we accumulate this large number of simple, self-sufficient computing units, they can interact among themselves in incredibly complex ways.

As Fredkin puts it, "What cannot be programmed cannot be physics. This is a very important idea. If a process cannot be programmed on a particular universal computer, despite having enough memory and time, then it cannot be programmed on any computer. If we can't program it on an ordinary computer, Finite Nature implies it can't be a part of physics because physics runs on a kind of computer."



According to Fredkin, the future is computed as a function of the present and (most likely) the past. One way or another, it is very likely a second-order system. There is not, and there need not be, access to the hardware of the Engine running the cellular automata from within the program.

Richard Feynman points out, Fredkin's notion of modeling nature as a reversible cellular automaton had a profound limitation: it failed to account for quantum processes. Quantum mechanics is not deterministic at all at the point of measurement. Rather, there are multiple possible outcomes that transpire according to probabilistic transitions and not predictable rules.

Feynman explains a quantum system could not be fully simulated using a traditional computer and its algorithms, instead, a quantum computer is needed. These computers based on qubits, are a representation of superposition of states (superposition of spin up and spin down) until a measurement is sized at the end of the computation.

Information in the universe

Information theory written in 1948 papers by American applied mathematician Claude E. Shannon, established nowadays broadly used measure of information content: entropy. Entropy is a principal concept of thermodynamics, the branch of physics dealing with heat. Thermodynamic entropy is generally characterized as the disorder in a physical system.

In thermodynamic equilibrium, there is only movement on the microscopic level ("this movement is heat"). Macroscopic structures, like the stars and planets, and their movements, escape from thermodynamic balance. This thermodynamic imbalance is caused by something named the "negative entropy."

The second law of thermodynamics states that the entropy (or disorder) of a closed physical system increases as far as it achieves a maximum or the imperative state of thermodynamic equilibrium. This implies entropy of the universe is continuously increasing.

The well-determined fact of increasing entropy guided many scientists and philosophers to consider the option universe is somehow "running down" to a possible "heat death."

Scientists think the universe beginning was in an immense state of information since the second law of thermodynamics postulates any organization or order inclines to decay. Certainly, the information remains today, and it has always been here.

The universe is in a state of equilibrium and is 13.75 billion years old. It is an open system in a dynamic state of expansion and is moving away from thermodynamic equilibrium faster than entropic processes can sustain balance. The maximum attainable entropy is increasing a lot faster than the definite increase in entropy. The difference between the maximum possible entropy and the real entropy is potential information (David Layzer).

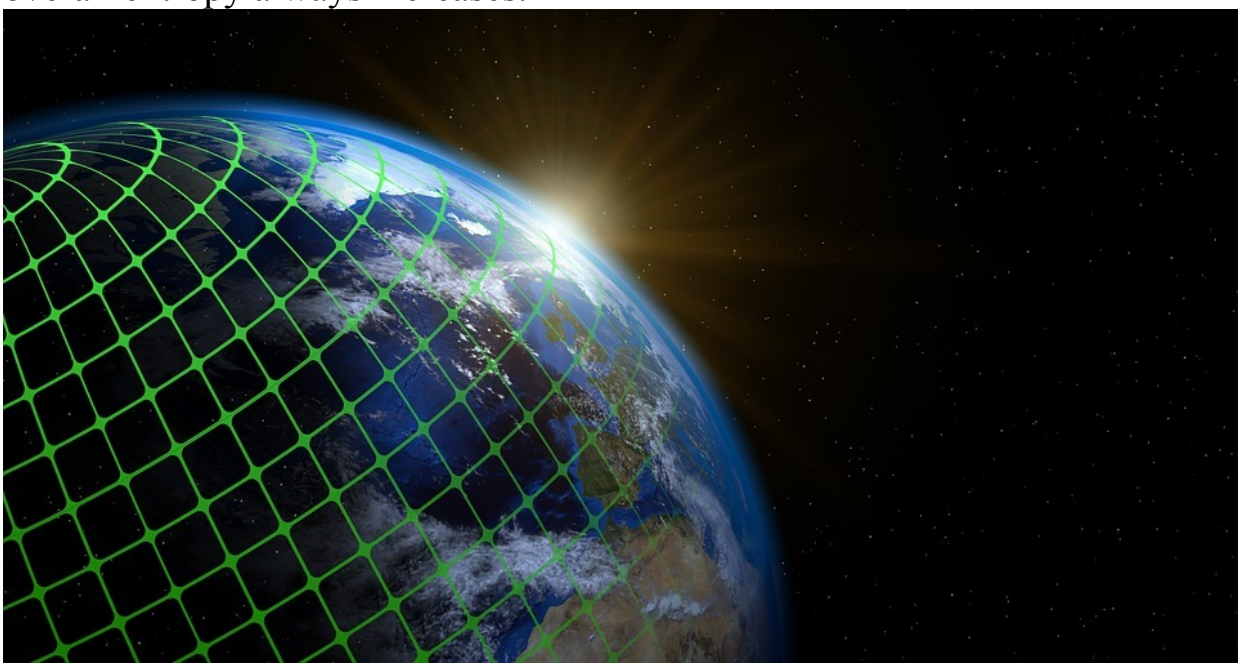
Generation of information framework means in certain parts of the universe the local entropy is decreasing. Development of a low entropy

system accompanies radiation of entropy away from the local framework to the remote parts of the universe.

During the expansion of the universe, positive and negative entropy generates. The positive thermodynamic entropy is the Boltzmann Entropy. The negative entropy name is the Shannon Entropy, and it is actually a measure of the information contained in the expanding universe.

Both information and entropy can thus increase at the same moment in the evolving universe. There are two main entropy/information flows. All along any process occurring in the universe, the positive entropy increase is at least equal to, or higher than, the negative entropy in any information structures created by the process.

Positive entropy must exceed the negative, as a precondition to satisfy the second law of thermodynamics, which as already explained and states overall entropy always increases.



Material particles (quarks, baryons, atomic nucleus, and electrons) are the first information structures to form in the universe. These material particles attract together by the universal gravitational force and form galaxies, stars, and planets, both the particles and the colossal information structures have exceptionally long lifetimes.

The thermodynamic equilibrium is the main reason for the origin of all the negative entropy which conditions even biological evolution on the Earth.

The fraction of the sun's light falling on the earth is less than a billionth of the light which passes by and is lost in space. Most of the solar energy is lost in space, only a very small fraction of it is descending on to earth surface and then it gets converted into the information structures of flora and fauna. Most of it transforms to heat and scatters away as waste energy into the night earth’s atmosphere.

Every organic structure is actually a quantum mechanical structure. The information contained in the universe is increasing, because in the evolving universe stars are still brought into existence, biological systems are developing brand-new species, and humans are co-creators of the world we live in.

Creation of information structures is the outcome of a blending of quantum mechanical and thermodynamic processes.

The energy equivalence of information

Maxwell's demon makes observations and thereby collects information. As scientist Brillouin points out such information is the negative of entropy (negentropy) and is equal to a cost in energy.

The energy cost of information is quantified in the relationship $E = kT \ln 2$, where k is the Boltzmann constant, T is the absolute temperature, and the factor ln 2 arises from existence of two possibilities for a "yes/no" circumstance, as, such as, passage of a proton through a barrier controlled by a Maxwell's demon (Matta CF, 2017).

Physicists in Japan have demonstrated experimentally a particle can do work by acquiring information, not energy. The scientists explain their experiment integrates a response system which commands the electric potential of miniature polystyrene beads and the experiment does not break the second law of thermodynamics.

The experiment carried out by Shoichi Toyabe of Chuo University in Tokyo and fellow scientists is basically the realistic realization of a thought experiment suggested by J. C. Maxwell in 1871. Maxwell conceptualized a gas originally at uniform temperature placed in a container divided into two compartments, with a very small intelligent being, later named “Maxwell’s demon”, which is controlling a curtain between both compartments.

By knowing the speed of every single molecule in the container, the controller demon can hypothetically pace the opening and closing of the curtain to compile faster molecules in one compartment and slower ones in the other. This allows the demon to decrease the entropy inside the container without delivering energy straight to the particles. However, this experiment seems defiant of the second law of thermodynamics.

Scientist L. Szilárd in 1929, disputed that the demon must somehow consume energy while performing measurement of the particle velocities

and this consumption of energy will lead to the net growth in the system's entropy. In fact, he worked out an equivalence between energy and information, calculating that kTln2 (or about 0.69 kT) is both the minimum quantity of work necessary to collect one bit of binary information and the maximum detached when this bit abolishes, where k is Boltzmann's constant and T is the temperature of the storage medium.

Toyabe and fellow scientists have noticed this energy-information equivalence by differing an electric field so it presents a kind of spiral staircase. The discrepancy in electrical potential between consecutive steps on the staircase is kT, meaning a thermally changeable particle implanted in the field will sporadically jump up a step but more often it will make a step directed downwards. The researchers interfered so the particle does move higher. They place the equivalent of a barrier behind the particle, hindering the particle from falling downwards. The particle through the repeating of this process will continuously climb the staircase.

A particle 0.3 μm-diameter compounded of two polystyrene beads was attached to a single point on the underside of the top of a glass container filled with an aqueous solution. The form of an enforced electric field compelled the particle to rotate in one direction or, to descent down the potential-energy staircase. Confused by the molecules in the solution, the particle rotates slightly in the reverse direction, granting it to make a step upstairs.

The motion of the particle is followed using a video camera and then using image-analysis software to establish when the particle had revolved against the field, the researchers were able to boost the metaphorical barrier behind it by reversing the field's phase. They could gradually raise the potential of the particle even though they had not conveyed any energy to it directly.

This means collections of particles can be rearranged to decrease their entropy without providing them with energy directly.

This discovery is to have confirmed conversion of information into energy. With measuring the particle's degree of rotation compared to the field, Toyabe and colleagues determinate they did convert the equivalent of one-bit information to 0.28 kTln2 of energy or, they could use more than a quarter of the information's energy content.

C. Van den Broeck of the University of Hasselt in Belgium describes the result as "a direct verification of information-to-energy conversion" but

indicates the conversion factor is an idealized figure. According to him, it regards only particle physics and ignores the far larger amount of energy consumed by the computers and human operators involved, which are not directly interfering on nanometre level.

He then contemplates molecular processes developing in nature might be converting information to energy in some way. “The message is that processes taking place on the nanoscale are completely different from those we are familiar with, and that information is part of that picture.”

Simulation in social science

Simulation (sim' yoo la 'shen) is a term used to describe an imitation or counterfeit. According to Websters Dictionary, this definition implies the presence of replication so well constructed that the product can pass for the real thing. Correlated to the study of research design, simulations can serve as an applicable replacement for designing and understanding terrain research.

Simulation is ‘a method for using computer software to model the operation of “real-world” processes, systems, or events’ (Davis et al. 2007:481). In simulation studies of this kind, the researcher develops a model of the phenomenon under investigation and then chooses the proper simulation method. The model specifies the concepts of interests and the “theoretical logic” (Davis et al. 2007:481) that links them together so they can be coded into computer software.

Trochim and Davis (1986) posit that simulations are useful for (1) improving student understanding of basic research principles and analytic techniques: (2) investigating the effects of problems which arise in the implementation of research; and (3) exploring the accuracy and utility of novel analytic techniques applied to problematic data structures.

According to social research methodology simulations are a mechanism helping the teacher, evaluator, analyst, researcher and methodologist address the manifold interaction of data structure and analysis, statistical theory, and contravention of a certain fundamental hypothesis. Actually, in a simulation, the researcher formulates data according to an existing model and afterward investigates how well the model is identified through the process of data analysis.

Necessary measurement, sampling, design, and analysis of data are concerns dependent on the model checked via the simulation. Researchers can operate the model of simulation and trail effects, to view directly the way results are developing and how the investigation alters during the

process. During the simulation, the analyst controls all the functional factors, providing provisional data and manipulating these systematically to check directly how certain assumptions influence the process.

The evaluator can construct models of evaluation problems making assumptions about the pre-test or type of attrition, group non-equivalence, or program implementation and see whether the results of any data analyses are seriously distorted. The methodologist can systematically violate assumptions of statistical rules and immediately assess the degree to which the estimates of program effect are biased (Trochim and Davis, 1986, p. 611).

While running a simulation, the examiner manages all the aspects fabricating the necessary input data and can manipulate these methodically to determine directly how specific problems and hypothesis influence the analysis. These simulations are performed on mainframe computers which are high-end commercial machines, with high reliability, security, and greater processing power than some other classes of computers: minicomputers, servers, workstations, and personal computers.

Though smaller simulations are processed on a microcomputer, with proper software on a relatively small cost. It is always beneficial to run many simulations for certain problem which is investigated. Long combination of commands is assigned and processed at once as a computational program, the same combination is run many times, producing results from every single run.

As explained simulation model is processed many times under separate parameters of the assigned conditions to check the outcome. Gilbert and Troitzsch (2005) show in a simulation the researcher is experimenting with the model and not with the real phenomenon. The process of specifying and building the computer simulation ‘involving being precise about what the theory means and making sure it is complete and coherent, it is very valuable discipline in its own right’ (Gilbert and Troitzsch 2005:5). They convey the scientific opinion where the simulation model has leverage over traditional mathematical modeling when the interest is in processes and mechanisms and not an association between variables. Harrison et al. (2007) show simulation is vulnerable to misspecification of the model itself.

Social simulation is a research field that applies computational methods to study matters in the social sciences.

The issues explored include problems in computational law, psychology, behavior, sociology, political science, economics, anthropology, geography, engineering, archaeology and linguistics (Takahashi, Sallach & Rouchier 2007).

Artificial society is a specific agent-based computational model for computer simulation in the field of social analysis. It is mainly linked to topics like complex system, emergence, Monte Carlo method, computational sociology, multi-agent system, and evolutionary programming.

The artificial society has been generally accepted by sociology science as a favorable methodology characterized by the broad application of computer programs and computer simulations which include evolutionary algorithms, genetic algorithms, genetic programming, memetic programming, agent-based models, and cellular automata.

Robert Axelrod regards social simulation as a third way of doing science, differing from both the deductive and inductive approach. Generating data analyzed inductively is coming from a rigorously specified set of rules and not from direct measurement of the real world.

Thus, simulating a phenomenon is to generate it, such as constructing artificial simulated societies. Complex, non-linear simulation models are often used in present-day social research. However, most of the findings of this social simulation work is restrained to the scientific literature in these fields of research.

According to Gilbert and Troitzsch 2005, Davis et al. 2007, simulation study involves following universal steps: research question suitable for simulation, specified model design, simulation model building, model testing and verification, running the simulation within parameters or first conditions, model validation, findings and conclusions in response to the research question.

The Simulation Hypothesis

The simulation idea dates back as far as the 17th-century philosopher René Descartes. Swedish philosopher Nick Bostrom in his paper from 2003 argues at least one of the following propositions is true:

(1) the human species is very likely to become extinct before reaching a 'posthuman' stage;

(2) any posthuman civilization is extremely unlikely to run a significant number of simulations of its evolutionary history (or variations thereof);

(3) we are almost certainly living in a computer simulation. He presents the belief there is a significant chance that we shall one day become posthumans who run ancestor-simulations is false unless we are currently living in a simulation.

He concludes If (1) is true, then we will almost certainly go extinct before reaching posthumanity.

If (2) is true, then there must be a strong convergence among the courses of advanced civilizations so that almost none has relatively wealthy people who wish to run ancestor-simulations and are free to do so.

If (3) is true, then we almost certainly live in a simulation. In the dark forest of our current ignorance, it seems sensible to apportion one's credence roughly evenly between (1), (2), and (3). Unless we are now living in a simulation, our descendants will almost certainly never run an ancestor-simulation (N. Bostrom first version 2001; final version 2002, published 2003).

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Practically the basic idea of Nick Bostrom's paper conveys through the following inquiry: If there was real chance our civilization will ever get to

the posthuman stage and run many ancestor-simulations, then how come you are not living in such a simulation?

According to Oxford dictionaries, posthumanism is the idea that humanity can be transformed, transcended, or eliminated either by technological advances or the evolutionary process; there is an artistic, scientific, or philosophical practice which reflects this belief.

I argue it is highly unlikely that humanity can become posthuman, because of the reversal of the Flynn effect or the general trend of decline of the intelligence quotient that is likely to holt the technological advancement in the future. Additionally, the pollution-induced heritable changes in genes expression of humans will influence destructively the evolutionary process.

It is unrealistic and illogical for someone to postulate humans will become posthumans, especially since M.A. Woodley and R. Murphy scientific research determined findings which strongly show that the Victorians in 1889 were substantially cleverer than modern Western populations in 2004, they determinate difference in IQ decline was incredible 13.35 points. The trend of IQ decline among the human population in the investigated period of 115 years means that if the IQ decline continues its long-standing trend, in the next 260 years the average intelligence quotient among the humans in the year 2280 will be less than 69 IQ points (challenged).

The basic idea or the third proposition of Nick Bostrom's paper is absolutely incorrect, since humanity will never become posthuman and will not run ancestor simulations, since there is immense declining trend in the intelligence quotient points of the population, but yet further down in my book I will hypothesize that we almost certainly do live in simulation.

However, I praise Bostrom for using the phrase "current ignorance" in his concluding remark for the third proposition.

At a conference in June 2016 tech entrepreneur Elon Mask said: "There's a billion to one chance we're living in base reality,".

"Soon there will be nothing technical standing in the way to making machines that have their own consciousness," said Rich Terrile, a scientist at Nasa's Jet Propulsion Laboratory.

"Even things that we think of as continuous time, energy, space, and volume all have a finite limit to their size. If that's the case, then our universe is both computable and finite. Those properties allow the universe to be simulated," Rich Terrile said.

The simulation hypothesis also explains peculiarities in quantum mechanics, particularly the measurement problem, whereby things only become defined when observed.

Reasons to believe in programmable simulated universe include the fact that it functions mathematically and divides down into subatomic particles which is quite an analogous principle of functioning as a pixelated digital simulation or something like a video game. Could it actually be that subatomic particles are nature's counterpart to the bits and pixels that digital worlds are composed of?

During the 2016 Isaac Asimov Memorial Debate, scientist Neil deGrasse Tyson explained that chance of our universe being simulated is 50 percent. He said there is real intelligence difference between chimpanzees and humans even though there is only 98 percent DNA overlap, he argued a being possessing many times higher intelligence could both exist and potentially run simulations.

Physicist James Gates while studying equations about electrons and quarks, determinate that there are “error-correcting codes” similar in principle to those used in Web browsers published Scientific American.

Fibonacci sequence

Leonardo Pisano presented the progression of numbers, now known as the Fibonacci sequence. It is a series starting from zero where the sum of (N-1)th sum and (N-2)th sum gives the Nth sum i.e. the sum of the foregoing two sums. Simply, the series is as follows 0,1,1,2,3,5,8,13,21,34,55, etc. This sequence is seen in nature such as the number of petals on certain flowers, such as, lily with 3 petals, buttercups with 5 petals, chicory with 21 and daisy with 34 petals.

Another representation of this phenomenon, seen in the universe is the Golden Spiral and the golden rectangle. A Fibonacci or Golden spiral is a sequence of connected quarter-circles strained inside a collection of squares with Fibonacci numbers as dimensions.

Other examples are the structural arrangement of seed pods on a pine, cauliflowers, pineapples with every single unit consisting of a pair of spirals, each one spiraling upwards in opposing directions with the number of steps matching successive Fibonacci numbers. It is found in snail shells, elephant tusks, cochlea of the inner ear, horns of certain goats, also macro phenomena such as the form of spiral galaxies consent to this golden ratio.

The Fibonacci sequence and its derivatives are beneficial numerous phenomenon varying from contemporary finance, computation, art, and natural occurrences.

Nowadays researchers claim golden ratio is found in the topology of space-time, influencing the entire universe as a whole. This research by Dr. Jan Boeyens at the University of Pretoria and Dr. Francis Thackeray of the University of the Witwatersrand in South Africa state that the golden racks or Phi of 1.618 relate not only to aspects of mathematics but also to physics, chemistry, biology and the topology of space-time. Actually, it may define the way things in the universe form.

The golden ratio represented through the proportion of human hand to the forearm, also as the length among the three knuckles on each finger.

‘A convincing case for assuming a cosmic character of the golden ratio can be made based on the ubiquity of logarithmic spirals,’ the researchers write. ‘Spectacular examples include the Whirlpool Galaxy (M51), ammonites, the shape of Nautilus shells, Hurricane Katrina and distribution of planets, moons, asteroids, and rings in the solar system.‘

The researchers propose the reason this ratio is so ever-present is that it is really a property of space-time. Thus the researchers say the golden ratio might make up space-time itself.

Phi shows up in the solar system and in the universe, from the distances between the planets, to the arrangement of Saturn's rings and to the form of the universe. New findings show it to exist in molecular structures and the basic building blocks of quantum matter and time.

Research article called “Strange Nonchaotic Stars” published at the American Physical Society described the discovery of a class of white-blue

variable stars that pulsate in a fractal pattern at frequencies near to the golden ratio.

The discovery was reported by John F. Lindner, Vivek Kohar, Behnam Kia, Michael Hippke, John G. Learned, and William L. Ditto. The analysis was performed by John Lindner at the University of Hawaii and fellow researches. The stars are an example in the universe of what chaos theorists call a “strange nonchaotic attractor,” a system which has a fractal structure, but not the sensitivity to initial conditions of a chaotic system like the weather.”

The fractal pattern was explained as being “strange.” “Nonchaotic” means the pattern is orderly and not accidental. Most fractal patterns in nature, such as weather, are chaotic, so these characteristics of the variable stars ware indeed unexpected.

Researchers acquired data collected by the Kepler Space Telescope to determine the brightness of a certain star, known as KIC 5520878, at approximately 30-minute intervals over a four-year span. Variable stars dim and glow sometimes at more than one frequency.

Two of this star's frequencies, at a 4.05-hour and a 6.41-hour cycle, each exhibited a ratio of 1.58, which is near to the golden ratio. Frequencies established on multiples of irrational numbers are representations of strange non-chaotic dynamics.

Researchers from the University of Hawaii at Mānoa have been examining stars known as Golden RR Lyrae variables. Dr. Lindner said, "We call these stars 'golden' because the ratio of two of their frequency components is near the golden mean, which is an irrational number famous in art, architecture, and mathematics."

The authors are confident this fractal pulsation may carry information about characteristics of the star's surface, such as changes in opacity. They offered this as evidence of the first observations outside the laboratory of strange non-chaotic dynamics in nature.

The theoretical framework of the Simulation model

"Facts which at first seem improbable will, even on scant explanation, drop the cloak which has hidden them and stand forth in naked and simple beauty" Galileo Galilei – 1564 to 1642.

"The supreme task is to arrive at those universal elemental laws by pure deduction. There is no logical path to these laws, only intuition, resting on sympathetic understanding of experience, can reach them"
Einstein.

Two centuries ago, chemist John Dalton presented the theory that all matter in the universe consists of particles named atoms. Each atom has an amazingly small nucleus and even tinier electrons, which are ghostly objects moving around the nucleus at distance from the center of the atom.

The nucleus is around 100,000 times smaller than the atom, it consists of protons and neutrons, which themselves are made of a trio of fundamental particles called quarks. The mass of quarks accounts for only a tiny part of the mass of the protons and neutrons. Gluons, which clasp quarks together, are completely massless.

The atoms are mostly empty space and are basic building blocks of the expanding universe which in itself is almost entirely 99.9999999 percent empty space. Thus, we and all the solid objects we perceive are predominantly nothingness.

This surprising discovery that atoms are mainly empty was announced in 1909 at Manchester University by the scientist Ernest Rutherford. Rutherford had great courage as a scientist and was inclined to travel in the

appearance of the convention. So when he announced the atom was mostly empty, it was a tectonic moment in the history of science. Science's response to this discovery was to create altogether new science, called quantum mechanics.

The astonishing and bothersome verifiable truth scientists discovered while researching the atom was a law now known as "Heisenberg's Uncertainty Principle". It states atoms are in more than one place at the same time until a conscious observer looks at them.

For example, if a conscious observer is not looking at the atoms composing his leg, they're definitely spread out across the whole Universe. Afterward, when the observer or someone else looks at the leg, the atoms instantly blend into the leg recognizable form.

Certainly, we know when atoms combine to form everyday objects, they halt the 'weird' actions but no one can know why, when and how they transfer their state to the other. It seems inconsistent where can we draw the boundary between the strangeness of the atomic realm and the common-sense world.

Without any doubt, science confirmed atoms are mostly empty space and they spread across the expanding universe when not observed by a conscious observer. In theory, if elementary particles don't possess any mass, they would wander around the universe at speeds very close to the speed of light, which wouldn't enable the particles to bind together into atoms, which then forms the matter.

The mass-generating mechanism responsible for physical reality and reason for our existence is the Higgs boson. In a paper published in October 1964, Peter Higgs at the University of Edinburgh, UK predicted the existence of a particle we now know as the Higgs boson.

The Higgs field is a theoretical field of energy that permeates the universe, it exists throughout all of space and particles acquire their mass by interacting with it. The Higgs field interacts with the electron field, the quark fields, and all the other lepton fields, in a very specific place in the mathematical formulas or the same position where we usually place the mass of the particle.

Currently, the Higgs field is on a minimum potential energy state. The Higgs boson is about 126 billion electron volts, or about the 126 times the mass of a proton. This is the exact mass necessary to keep the universe on

the brink of instability. One can only wonder how comes this mass-generating mechanism is so fine-tuned?

In his book "Just Six Numbers: The Deep Forces That Shape the Universe" (Basic Books, 2001), astronomer Martin Rees focuses on particular "dimensionless constants" he considers fundamental to physics. Actually, there are more than six constants; about 25 exist in the Standard Model of particle physics.

The fine structure constant, usually marked as alpha, controls the strength of magnetic interactions. Its value is around 0.007297. What makes this number so special is that if it were any different, the stable matter wouldn't possibly exist.

Another constant in physics, surprisingly adjusted for life to exist is the proportion of the masses of multiple fundamental particles, such as electrons and quarks, to the Planck mass (which is 1.22 ´1019 GeV/c2). Why those distinct numbers have the values they do? If the constants had different values, the universe's physical laws wouldn't allow for humanity to exist.

Time moves forward because of a property of the universe we call "entropy," roughly defined as the level of disorder, only increases, hence there is no way to reverse a rise in entropy after it has happened.

The primary question is why was entropy so low in the past? To rephrase, why was the universe so well-ordered at the point of its origin, when a huge amount of energy squeezes together in a small amount of space? Is it logical to think there was order before the Big bang and what might be the reason for that?

Famous physicist Stephen Hawking explained the concept of negative energy in his book The Theory of Everything (New Millennium 2002): "Two pieces of matter that are close to each other have less [positive] energy than the same two pieces a long way apart, because you have to spend energy to separate them against the gravitational force that is pulling them together," he wrote.

Since it takes positive energy to separate the two pieces of matter, gravity is using negative energy to pull them together. Thus, "the gravitational field has negative energy. In the case of a universe that is approximately uniform in space, one can show that this negative gravitational energy exactly cancels the positive energy represented by the matter. So the total energy of the universe is zero."

Caltech cosmologist Sean Carroll states: "You can create a compact, self-contained universe without needing any energy at all."

On September 27, 1905, Albert Einstein published “Does the Inertia of a Body Depend Upon Its Energy Content?” in the journal Annalen der Physik. In the paper, he defined the interchangeable nature of mass and energy, representing the relation through the equation $E=mc^2$. In the equation E is energy measured in joules (J), m is mass measured in kilograms (kg) and c is the speed of light in a vacuüm (c, equal to 186,000 miles per second). Thus, a small amount of mass equals a large amount of energy.

Since we know that mass and energy interrelate, also knowing that all the atoms in the universe are predominantly empty space and massless, I contemplate that any specified object anywhere in the universe is equal only to zero energy. If we sum up the zero values of energy from all the objects in the universe we conclude the notion that Stephen Hawking explained, the energy in the universe is zero.

I then hypothesize without the interference of the Higgs mass-generating mechanism the universe is almost entirely empty space and its energy is zero. Hence the space-time continuum and geometry are non-existent on a fundamental level in base reality.

According to Oxford dictionaries, the reality is the state of things as they actually exist, as opposed to an idealistic or notional idea of them.

The simulated reality of an empty universe, which doesn’t contain any energy or mass, and comes into existence from the manipulation mechanism of the Higgs field is realistic. Even space-time geometry which results from the presence of mass-energy is under a big question mark, because for a fact it is empty.

Physicist Stephen Hawking has said: ...if the universe came from nothing and brought everything into existence...

I argue that in the above fragment of a statement everything is equal to nothing. In my opinion, the universe came from nothing and brought nothing into existence. When I write nothing I mean nothing physical, because the universe does contain a colossal quantity of information.

So here's the deep question: Is information the ultimate constituent from which the cosmos is constructed?

Physicist Paul Davies, director of BEYOND: The Center for Fundamental Concepts in Science at Arizona State University, frames the question: "Historically, matter has been at the bottom of the explanatory

chain, and information has been a sort of the second derivative of it," he then adds, "there's increasing interest among at least a small group of physicists to turn this upside down and say, maybe at rock bottom, the universe is about information and information processing, and it's matter that emerges as a secondary concept."

There is general agreement among scientists that information has a role in all that happens in the evolving universe, but sadly it is still a minority view that information is more fundamental than physics.

In my perspective not only information has a role in all that happens, but it is also actually the universe in itself. The eminent John Archibald Wheeler in his later years was a strong supporter of information theory. Wheeler believed the universe had three parts: first “Everything is Particles,” second, “Everything is Fields,” and third, “Everything is Information.” In 1989, Wheeler wrote a paper to the Santa Fe Institute, where he stated “every it-every particle, every field of force, even the space-time continuum itself, derives its role, its meaning, it's very existence entirely, even if in some contexts indirectly, from the apparatus elicited answers to yes or no questions, binary choices, bits." He composed the phrase “It from bit.” Wheeler idea is that the universe emanates from the information inherent within it. Each of it or particle is fundamentally a bit.

Seth Lloyd, an MIT professor specializing in quantum information, explains this idea as "a physical system that breaks up information into bits, and flips those bits in a systematic fashion."

He says electrons have spins, defined by laws of quantum mechanics. Electrons can take only two distinguishable values: spinning up or spinning down, positions analogous to the same binary characters of computer bits. So, at rock bottom, Lloyd says, the universe consists of information which every elementary particle carries.

Finally, Lloyd concludes "The universe is a physical system that contains and processes information in a systematic fashion and that can do everything a computer can do."

Information gives an answer to the question of "what something is" and is that which specifies the nature of that something, as well as essentiality of its properties and characteristics.

Information entropy is the average rate at which information generates by a stochastic source of data. The concept of information entropy was introduced by Claude Shannon in his 1948 paper "A

Mathematical Theory of Communication". Shannon entropy does not enlighten us about the value of information, which is highly dependent on context. Yet as an objective measure of the quantity of information, it has been enormously useful in science and technology.

For instance, the design of every modern communications device, from cellular phones to modems to compact disc players relies on Shannon entropy. Thermodynamic entropy and Shannon entropy are conceptually equivalent: some arrangements counted by Boltzmann entropy reflect the amount of Shannon information one would need to carry out any particular arrangement. The two entropies have two salient differences, though. First, the thermodynamic entropy used by a chemist or a refrigeration engineer expressed in units of energy divided by temperature, whereas the Shannon entropy used by a communications engineer is in bits, essentially dimensionless. That difference is merely a matter of convention (J. D. Bekenstein 2007).

The property of the universe we name "entropy," is defined as the level of disorder, only increases, and there is no way to reverse a rise in entropy after it has happened. Interestingly, the universe was well-ordered at the point of its origin.

After the Big bang, the Higgs field had value zero, but in theory, as the universe was expanding and cooling, the temperature fell below a certain critical value, the Higgs field grew spontaneously so any particle interacting with it acquired a mass. A possible reason for such a great order before the Big bang and the value zero of the Higgs field may be a well-encoded information structure which is the only real thing that ever existed in our universe.

The holographic principle states there is a duality between a volume of space and the surface encasing that volume. It determinate that all the information contained within the region of space defines the information on the surface enclosing it. Holographic duality consistently works in the framework of 10-dimensional hyperspace which is actually critical string theory.

Edward Fredkin writes all matter in nature and physics is finite, from one moment in time to the next, the information is transformed effectively to a new and different, but uniformly finite, set of information describing a particular volume of space-time as it exists in the next moment of time. By compressing the volume of space-time to an allegorical representation of the

information it contains, Fredkin crops the full equivalent of the volume of space-time in the pattern of the information itself.

However, in an empty universe, the information about the nature of the particles in the universe and its properties mathematically is consistently represented via the equations from string theory.

The string theory hypothesizes that within the subatomic particles which build up everything in the universe, there are circular vibrating strings (mathematical abstractions) of energy accountable for the existence or the physical representation and properties of those particles. According to the theory, certain vibrations the strings of energy generate are able to produce various types of particles.

Actually string theory via string energy vibrational fluctuations describes everything present in the universe; from the composition and emergent properties of atoms creating matter to interaction with the Higgs field which creates the existence of space-time geometry. If we make a transfer from subatomic particles to string-like entities (tubes of energy), the holographic principle is the applied calculation method.

Maxwell's demon confirmed the equivalence between information and energy. Collections of particles can be rearranged in such a way to decrease their entropy without providing them with energy directly, which was discovery confirming conversion of information into energy.

Just to remind you, with measuring the particle's degree of rotation compared to the field, Toyabe and colleagues determinate they did convert the equivalent of one-bit information to 0.28 kTln2 of energy or, concluding they could use more than a quarter of the information's energy content.

Church-Turing-Deutsch Principle says every physical process is simulated by a universal computing device. To quote the CTD Principle given by David Deutsch: Every finitely realizable physical system is perfectly simulated by a universal model of a computing machine operating by finite means. Thus we can easily see the Dual of CTD Principle which states that every finite realizable computing machine is perfectly simulated by a universal model of a physical system operating by finite means (A. B. Smith and S.E. Lammers 2014).

"If the doors of perception were cleansed, everything would appear as it is, infinite" William Blake – The Marriage of Heaven and Hell (1793).

I hypothesize a Simulation model of the universe may have a purpose to extract energy from the processing of information done by a quantum computing device and generate it into 6 dimensions (out of 10 D in Superstring theory, because 4 D is exempt) which are consistently mathematically described by String theory.

The primary source of energy is the information's energy itself since the representation and properties of particles are changing with the interference of the Higgs field mechanism the information content related to the nature of that particle and its characteristics are changing, which we can call information processing.

This automatically changes the kinetic energy of vibration of the one-dimensional strings of energy, obviously part of a vibration-powered generator of energy. It seems likely when the string vibrates in one mode, it can only be forced into a different mode by an additional point of detainment, so reversible process can be done with a device that has a mechanism we can call "resonator" which amplifies the vibration source, to influence information and thus the physical representation of the particle and its characteristics can be manipulated.

With transducer alike mechanism string's vibrational energy can be converted into energy suitable for use in 6-dimensional base reality (again 4 D is exempt).

From the Second Law of Thermodynamics “When energy changes from one form to another form, or matter moves freely, entropy (physical disorder) increases”, it follows that reason why entropy in our universe is only increasing is transformation of information’s energy into energy suitable for use in 6D spatial base reality, by the vibration powered generator which is processing the information contained in our universe.

It can not be something else because Stephen Hawking himself explained total energy in our universe is zero and thus zero energy transformation can not transform in energy of value of another type, so the entropy could not possibly increase if there isn’t another type of transformation as I explain above from information in our 4D into energy in 6D base reality which we can not observe and only have indirect knowledge of by the observations we make in our 4D reality.

In my view, the mere fact entropy is increasing in our universe which contains total energy 0 is a reason enough to conclude another type of energy-related transformation is happening.

In mathematics Fourier transform is a function derived from a given function represented by a series of sinusoidal functions. In other words,

Fourier analysis is the study of the way general functions are represented or approximated by sums of simpler trigonometric functions.

Fourier transform outputs vibration amplitude as frequency. As we already know the most successful quantum algorithms use Quantum Fourier transform for processing information in quantum computing but the same transform is also used to analyze oscillation motions such as the vibrations of strings.

With this correlation, I support the above postulate that quantum computer can simulate our reality in detail, the sign and representation of which is the mathematical sophistication of String theory.

The simulation model in the simplest of terms is a mechanism which processes encoded information and transforms it into energy. Since the information contained in the universe is increasing, because information structures form in the evolving universe, stars are still brought into existence, biological systems are developing brand-new species, and humans are co-creators of the world we live in, etc., the vibration-powered generator of energy is evolving and increasing its energy generating capacity.

A certain quantity of this vibrational like energy generating from the strings can be used for internal consumption of the system so it can power the Higgs field. As we know the Higgs field can take different values at different points in space-time, and each value corresponds to the average number of particles observers see in that patch. Particles are created and destroyed at will, simply by adding or removing energy from the field, this certainly, can be understood as a control mechanism of the processing of information.

It is likely, Higgs field conveys the instruction encoded in the information pattern. One particle is just the minimum feasible quantity of energy the field can bear. Every single particle, from the electron to a photon, relates with its own space-time filling vibrating Higgs field.

I want to point out such a vibration-powered generator of energy is likely to be less efficient than Maxwell's demon experiment, which proved information can transform into energy, because the universe generator needs extra power consumed by the Higgs field, in contrary the demon is completely self-sufficient to transform quarter of the information's energy content. Certainly, the scales on which each mechanism operates are on the completely different side of the specter, but the principle fundamentally is very similar.

In another view, in a physical system frequency of a wave is the same as the frequency of the vibrations caused by the wave. I remind you when a quantum "observer" is watching, quantum mechanics states particles can also behave as waves. This is true for electrons at the subatomic level. When functioning as waves, they can simultaneously pass through several openings in a barrier and then meet again at the other side of the barrier. This "meeting" is known as interference.

However, interference can only happen when no one is watching. Once an observer starts watching the particles going through the openings, the picture changes dramatically: if a particle is seen going through one opening, then it's clear it didn't go through another. In other words, when being observed, electrons are being compelled to behave like particles and not like waves. Thus the mere act of observation affects the experimental findings (Weizmann Institute Of Science, 1998).

In theoretical physics, as we already explained there are vibrational strings of energy that generate and are able to produce various types of particles.

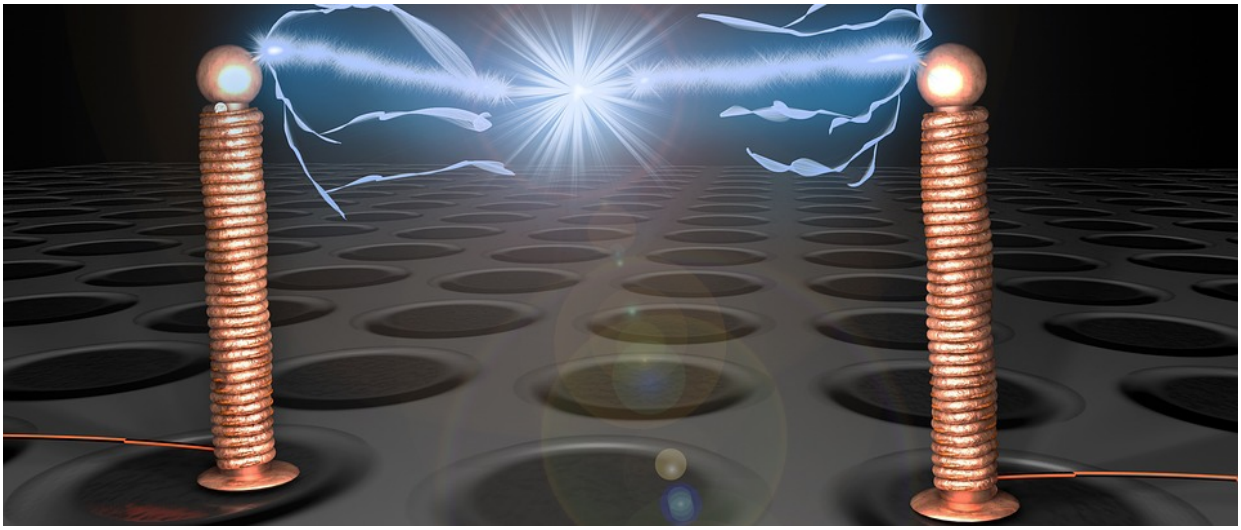
In a principle, there is a relation here between the frequency of the electrons behaving like waves when they are not being observed and the resonant frequency of the vibrations of the strings generating the waves themselves.

In the year 1933 genius Nikola Tesla finally revealed to the public he had discovered a new source of limitless energy. He said mankind should be very glad it exists, but he never said what it was. The secret apparently died with him.

“I shall not announce the scientific principles of the discovery nor describe the mechanical means I have devised for carrying it out, for the present. It is sufficient at this time to say that I have performed experiments and obtained results from which I am able to calculate what the mechanism may be expected to perform. Much, of course, remains to be accomplished, but it is work not necessarily of a creative kind; it can be done by many, and hence development to the point of actual operation may be enormously speeded up.” (While in its present form the theory calls for the development of the energy in central plants requiring vast machinery, Dr. Tesla said he might be able to work out a plan for its use by an individual.) – Tesla interviews, 1933.

Later in 1937, Nikola Tesla announced: “I have devoted much of my time during the year past to the perfecting of a new small and compact apparatus by which energy in considerable amounts can now be flashed through interstellar space to any distance without the slightest dispersion.” (New York Times, Sunday, 11 July 1937.)

Without a doubt, Tesla’s claims relate to his life’s vision, our planet and whole galaxy using wireless power from a gigantic energy source which can be exploited via mechanical means. Certainly, this implies he wanted to access and use a mechanical mechanism existing all around the expanding universe. The energy Nikola Tesla planned to use is undetectable for us, nether we can define a source of energy, around the vast universe, which can be exploited and transferred with “mechanical means” as he meant in his interview in 1933.



Since the energy source, he envisioned can “flash energy in considerable amounts through the interstellar space to any distance” it is only logical to think the source is everywhere and it can be accessed from anywhere for instant transfer of energy.

Nowadays, at this stage of scientific and technological development, only the theoretical framework of string theory consistently describes mathematical abstractions known as strings of energy propagating through 10-dimensional space-time in a mechanism like fashion.

Six of these dimensions are compacted to sizes so small no one has ever observed them and are representing strings of energy. We know all the particles and forces in nature can be described in 10 D by the mathematical contraptions of string theory, also we know Tesla wanted to get access to a source of energy present everywhere.

I wonder if string theory is somehow equal in principle to the basic concept of the theory Tesla was working on. Did he actually think it is possible to exploit and transfer the energy from the strings themselves from that 6 D into our own 4 D space-time?

Nikola Tesla years-long work might have been inspired by the principle that compact dimensions may advance into consolidating theories dating back to the 1920s, or since the theory of Kaluza and Klein, because it can be considered string theory is the ultimate Kaluza-Klein theory.

“Heisenberg’s Uncertainty Principle” states that atoms are in more than one place at the same time until a conscious observer looks at them. String theory hypothesizes that within subatomic particles, there are circular

vibrating point like strings of energy responsible for the existence of those particles.

I can suggest if the atoms are in more than one place at the same time, then the strings must also be abiding the same principle. If Tesla's idea was to flash considerable amounts of energy in interstellar space then string theory principles are the only consistent scientific theory that holds.

Maybe the great scientist Nikola Tesla was walking on a road less traveled to experimentally prove string theory. In my opinion, it is possible that Tesla was working on a mechanical mechanism using reversible principle then the vibration-powered generator of energy I hypothesized previously as simulation model mechanism of the universe.

If this was the case I understand quite well what halted his progress. However, this is not a theme I will elaborate in this book.

Simulation of humanity and possible alien civilizations may just be a matter of prestige of the creators, so they can achieve greater sophistication of the energy generator. A possibility is that they are maybe researching self-learning anticipatory systems which are in practice evolutionary systems.

They may be also using, researching or experimenting with Turing machine, quantum computers, evolutionary game theory, complex adaptive systems, cellular automata, self-assembling machines, self-replicating machines, cognitive computing, consciousness, simulation is a social science, etc.

One's normal reaction to the presented simulation model concept would be cynical, but from the RNA DNA creationism conundrum, it is quite clear scientists can't even speculate how life on earth came to be.

I quote: “Question emerges if RNA pre-originates DNA, how RNA formed, so life on earth can begin. Some scientists speculate non-enzymatic, geochemical reaction created RNA since it is a highly unlikely biological process to originated RNA because at that point of time life didn’t exist on the prebiotic earth.

Actually, a key question is how first biological polymers RNA could have formed without enzymes on early Earth.

The base pairs holding together two pieces of RNA are the crucial molecular interactions in living cells. However, this is problematic, because the RNA bases don't form base pairs in water unless they are connected to a polymer, an aspect that has confused scientists for a long time. If the bases don't pair before they are part of polymers, how would the bases have been selected out from the many molecules in the prebiotic medley on earth so that RNA polymers could be formed?”

Author's note

"The truth which makes men free is, for the most part, the truth that most men do not want to hear" Herbert Agar – 1897 to 1980.

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The mankind (Homo sapiens) is in a transitional phase, hence it must be open to the principle majestic statistical rules of physics as they relate in the microscopic spaces among the neurons in human's brain. Humanity as a matter of great importance must be ready for the higher days that are coming.

Now, Therefore, I Dr.Amschel (pseudonym) do hereby proclaim the weekend of February 22, 2019, HUMANITY NOTIFIED OF THE EXISTENCE OF THE PRIME CREATOR.